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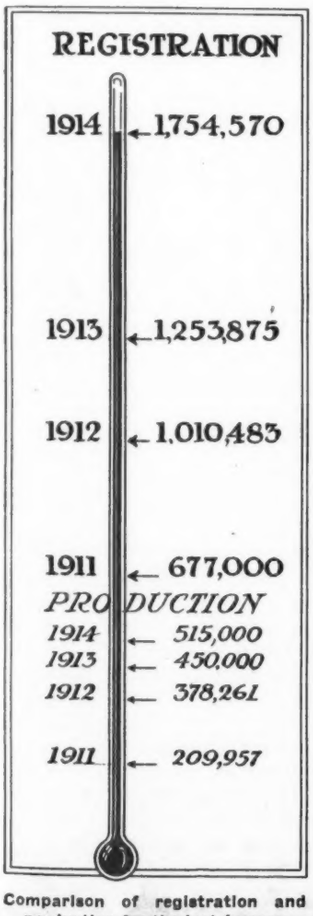
The AUTOMOBILE

United States Has 1,754,570 Cars

1914 Registrations Show Gain of 500,695 Over 1913—Increase of 1,077,570 in 4 Years

By Donald McLeod Lay



Comparison of registration and production for the last 4 years

OVER half a million cars and trucks were added to the number in operation in the United States during the year 1914. According to the most accurate statistics it is possible to obtain from state registration officials and other authentic sources, the total number of cars and trucks in the United States at the end of 1914 was 1,754,570, all duplicate registrations, dealers, etc., being deducted where such figures were separately listed. This represents a gain of 500,695 over the total at the end of 1913. An idea of the steady increase in registrations may be gained from the statistics on July 1 and October 1. On July 1 the total was 1,548,350 cars and trucks, an increase of 294,475 since the first of the year and by October 1 these figures had grown to a total of 1,735,369 cars and trucks, a gain of 203,503 over the statistics reported at the beginning of July.

1,077,570 Gained in 4 Years

Very few people realize that since 1911 the number of cars and trucks in the United States have increased from 677,000 to 1,754,570 at the beginning of 1915, a gain of 1,077,570. In 1912 the total had increased to 1,010,483 and in 1913 to 1,253,875.

Naturally, production has increased by leaps and bounds from year to year to keep pace with the phenomenal car-buying evidenced by the swelling registration statistics. From a total of 209,957 cars and trucks manufactured in 1911 our factories have steadily increased their outputs, 378,261 vehicles leaving their doors in 1912 and 450,000 in 1913, while the figure of 515,000 given by the National Automobile Chamber of Commerce is so conservative that it is from 5,000 to 15,000 below the actual production total. The estimate for the number of trucks built last year is 30,000, which is a marked advance as compared with previous years.

In compiling the information contained in the table on page 527, every effort was made to secure the most accurate information possible as will be noted by the sepa-

New York	156,173
Illinois	131,140
California	123,101
Ohio	121,265
Pennsylvania	107,141
Iowa	106,087
Massachusetts	76,832
Michigan	76,389
Minnesota	67,365
Indiana	65,500
Texas	64,732
New Jersey	58,820
Wisconsin	53,180
Missouri	50,998
Kansas	50,467
Nebraska	50,000
Washington	30,253
Connecticut	26,218
Georgia	20,800
Maryland	20,213
South Dakota	20,080
Tennessee	19,668
Colorado	17,951
North Dakota	17,348
Oregon	16,347
South Carolina	15,000
North Carolina	14,815
Maine	14,300
Virginia	13,985
Rhode Island	12,331
Kentucky	11,746
Florida	11,366
Montana	10,706
New Hampshire	8,738
Alabama	8,425
Dist. of Columbia	8,000
Vermont	7,613
Oklahoma	7,360
West Virginia	7,217
Utah	6,139
Arkansas	5,642
Arizona	4,774
Mississippi	3,894
Louisiana	3,500
Idaho	3,272
New Mexico	3,090
Delaware	2,894
Wyoming	2,428
Nevada	1,487
Total	1,754,570

States in order of registrations with duplicates deducted

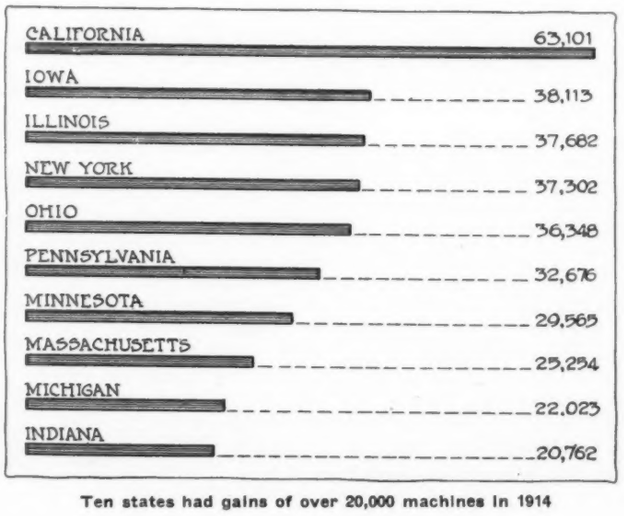
Map showing total registration of automobiles and motor trucks in the various states with duplicate registrations excluded

rate columns for non-resident registrations, re-registrations due to transfers of ownership, etc., and number of dealers' registrations. In order to get as nearly as possible to the exact number of cars and trucks in use, the totals of these three columns 7,523, 30,856 and 11,180 respectively, were deducted from the gross total of 1,785,613 registrations which included everything of this kind. Tennessee includes motorcycles with its car and truck registrations, the total number probably being less than 2,000 of the 19,668 given for that state. There are also some 3,000 steam cars and 300 steam trucks included among the gasoline machines.

It was found that previous figures given for the registration in the District of Columbia were far too high. H. M. Woodward, Secretary of the Automobile Board of the District, states that as registration, which is perennial there, was begun in 1907, transfers of ownership, etc., have so complicated the records that it is impossible to give even an estimate of the correct statistics.

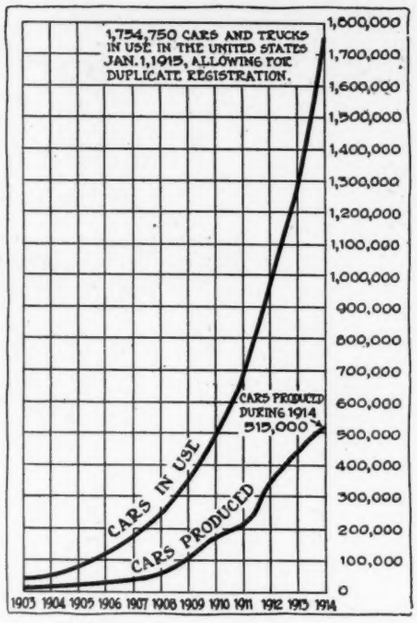
The Auto Directories Co., of New York City, having analyzed the registration lists, gives a total of 8,000 vehicles for the district. The same company gives 3,500 for Louisiana, which has local registration, like Texas, for which the Dallas Chamber of Commerce gives 64,732 registrations. G. R. Lamson, Librarian of the Firestone Tire & Rubber Co., and C. D. Ensign, of the B. F. Goodrich Co., agree in giving Mississippi a total of 3,894, this state being still without an automobile license law, the statute formerly in effect having been declared unconstitutional some time ago.

When we come to analyze the gains made by the various states over their respective totals for 1913, we find that California is apparently at the head of the list with a gain of 63,101. This, however, is misleading, inasmuch as when the statistics were compiled at the end of 1913 only 60,000 cars and trucks were registered in the Golden state under the new law which had just gone into effect. This, of course, was far from the actual total of cars and trucks in the state at that time, so the actual gain is probably less than 25,000. A much more significant figure is that which stands second on the list, the 38,113 registrations gained by Iowa. This represents actual increase in the number of cars and trucks added to the equipment of the residents of that prosperous state. Illinois is a close second to Iowa with 37,682 more machines than it registered in 1913, while New York comes next with 37,302, the three states forming a remarkable example of parallel gains. Ohio, with a gain of 36,348 has a good lead over Pennsylvania whose increase was 32,676, while Minnesota follows with 29,565 more than it had last year. Massachusetts is the only other state to record an increase of over 25,000 registrations, having 254 over that figure. Michigan and Indiana both have gains of over 20,000, Michigan having 22,023 and Indiana 20,762. Incidentally, Michigan's secretary of state anticipates a registration in 1915 of over 100,000 of cars and trucks. Wisconsin falls short of the 20,000 mark by only 264, having 19,736 added registrations, while Kansas has 16,101, Missouri 13,793 and Texas 10,369. The main



Ten states had gains of over 20,000 machines in 1914

reason for the tremendous car-buying indicated by these increases is that the farmers are beginning to realize that the automobile is here to stay, that it is a necessity and not a luxury, and they are finding it of everyday use for both work and pleasure. Practically all of the states show gains in registration from the 677 increase in Delaware to the 38,113 in Iowa. The only instances in which no increase is recorded are District of Columbia and Louisiana, for which previous figures were too high, and in Georgia and Oklahoma. In Georgia the new law is responsible for the apparent decrease, while in Oklahoma the registration law runs from July to June instead of throughout the calendar year as in most of the other states.



Registration and production since 1902

Changes in Standing

A number of changes have occurred in the standing of the various states in respect to the total number of car and truck registrations. Comparing the position tables for 1913 and 1914, of states having over 50,000 registrations, we find that California, which was seventh last year, is now in third place, this being due, of course, to incomplete registration under the new law. Ohio, which was third, is thus thrown into fourth place and so on down through the list. Minnesota, which was fourteenth last year, is now in ninth place, and Indiana has moved one notch into tenth position. Wisconsin was fifteenth and is now thirteenth, having displaced Missouri, which is now fourteenth. Kansas has gained one place, being now in fifteenth position. Nebraska has dropped from tenth to sixteenth.

Perennial registration still reigns in the District of Columbia, Florida, Utah and Texas, registration in the latter state being also of a local character. New laws, since the beginning of 1914, have affected the registration in California and Georgia. Local registration, besides being the rule in Texas, is found in Louisiana and South Carolina, while Minnesota is unique in having triennial state registration, that is, registration is required once every 3 years. The general tendency in automobile registration may be characterized as toward sane and reasonable measures, although the freak bills containing idiotic and objectionable regulations are still plentiful.

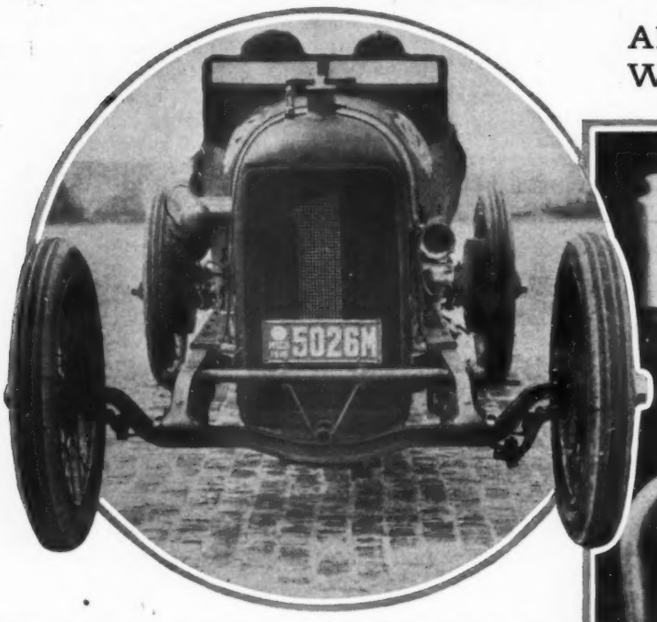
Car and Truck Registration in Each State to January 1, 1915, with Duplications Indicated

State or Territory	Total Registration	New Registration	Registration up to Jan. 1, 1914	Gasoline-Passenger Cars in Use	Gasoline Commercial Cars in Use	Electric Passenger Cars in Use	Electric Commercial Cars in Use	Non-Resident Registration*	Re-Registered**	Chauffeurs Registered	Total Fees	Dealers Registered	Remarks
Alabama	8,500	3,000	5,500	7,957	500	37	6	None	75	1,000	$116,000.00	.....	
Arizona	5,040	1,457	3,583	4,757	266	17	***	***	266	1,160	34,077.50	.....	
Arkansas	5,642	2,642	3,000	***	***	***	***	***	***	***	***	.....	
California	123,101	63,101	60,000	***	***	***	***	***	***	18,601	1,338,785.25	.....	New law. Previous reg. incomp.
Colorado	18,433	5,433	13,000	***	***	***	***	***	482	2,058	80,047.00	.....	
Connecticut	29,305	6,042	23,263	24,270	4,395	420	220	***	2,895	36,623	406,623.34	192	
Delaware	3,050	677	2,373	***	***	14	7	***	***	***	***	156	
Dist. of Col.††	8,000	.....	16,625	6,243	432	1,035	290	***	***	***	***	.....	Perennial reg.
Florida	11,366	1,994	9,372	***	***	***	***	***	***	***	***	.....	Perennia reg.
Georgia†	20,910	.....	22,000	***	20,000	430	100	50	60	***	100,950.00	.....	New law
Idaho	3,272	1,099	2,173	3,192	80	***	***	***	***	***	58,579.75	.....	
Illinois	132,338	37,682	94,656	***	***	3,200	810	***	***	17,827	699,725.30	1,198	
Indiana	65,500	20,762	44,738	***	***	310	12	***	***	2,860	427,800.00	.....	
Iowa	108,407	38,113	70,294	***	***	285	15	***	***	***	1,040,135.54	2,320	
Kansas	50,467	16,101	34,366	***	***	***	***	***	***	***	252,335.00	.....	
Kentucky	11,746	3,536	7,210	***	***	325	80	***	***	2,004	104,008.00	.....	
Louisiana††	3,500	.....	7,200	3,302	178	***	20	***	***	***	***	.....	Local reg.
Maine	15,700	5,130	10,570	15,061	635	3	1	700	700	18,428	36,856.00	.....	
Maryland	20,213	5,959	14,254	***	1,944	175	140	***	***	***	***	.....	
Massachusetts	87,000	25,254	61,746	77,093	8,236	923	748	1,500	7,150	***	922,460.75	1,518	
Michigan	76,389	22,023	54,366	***	***	1,150	225	***	***	4,783	183,169.30	.....	
Minnesota	67,365	20,565	37,800	***	***	803	142	***	***	***	***	.....	Perennial reg.
Mississippi†††	3,894	894	3,000	3,867	24	***	3	***	***	***	***	.....	Law invalid.
Missouri	51,933	13,793	38,140	***	***	1,314	219	***	***	6,581	235,873.50	935	
Montana	10,706	5,020	5,686	***	***	***	***	***	***	***	***	....	
Nebraska	50,000	2,626	47,274	***	***	***	***	***	***	***	***	.....	
Nevada	1,487	356	1,131	1,477	***	10	***	***	***	***	4,337.08	.....	
New Hampshire	10,596	3,160	7,436	9,220	1,296	60	20	1,160	698	2,199	200,002.50	.....	
New Jersey	60,247	8,887	51,360	***	***	96	164	None	1,427	70,313	814,535.30	.....	
New Mexico	3,192	1,471	1,721	***	***	***	***	***	***	***	19,663.23	102	
New York	169,966	37,302	132,664	145,186	14,864	7,455	2,461	2,377	11,416	66,636	1,529,852.36	1,743	
North Carolina	14,815	4,815	10,000	***	***	***	***	***	***	***	99,000.00	.....	
North Dakota	17,348	4,273	13,075	***	***	15	***	***	***	***	52,044.00	.....	
Ohio	122,504	36,348	86,156	118,071	***	3,877	***	83	***	11,276	685,457.25	1,156	
Oklahoma §	7,360	.....	7,934	***	***	150	***	***	***	***	***	.....	
Oregon	16,347	2,390	13,957	14,797	1,482	30	38	***	***	***	***	.....	
Pennsylvania	112,854	32,676	80,178	101,401	5,453	5,000	1,000	1,000	4,713	28,264	1,185,039.50	.....	
Rhode Island	12,331	2,149	10,182	10,973	1,208	28	32	***	***	17,695	157,020.00	.....	
South Carolina	15,000	3,500	11 500	***	***	5	***	***	***	***	***	.....	Local reg.
South Dakota	21,420	6,842	14,578	***	***	***	***	***	849	***	***	491	
Tennessee	19,668	5,565	14,103	***	***	80	4	***	***	***	11,130.00	.....	Motorcycles incl.
Texas §§	64,732	10,369	54,363	63,738	717	125	3	***	***	***	***	.....	Loc. & per. reg.
Utah	6,274	2,253	4,021	6,022	129	119	3	10	25	580	5,444.00	.....	Perennial reg.
Vermont	8,256	2,358	5,918	8,033	214	4	5	643	***	10,337	154,266.91	.....	
Virginia	14,152	5,130	9,022	***	***	21	25	**	***	1,209	125,000.00	167	
Washington	30,253	6,075	24,178	***	***	***	***	***	***	***	60,506.00	.....	
West Virginia	8,224	3,136	5,088	***	***	***	***	***	***	1,007	67,000.00	.....	
Wisconsin	54,382	19,736	34,646	***	***	***	***	***	***	***	277,820.00	1,202	
Wyoming	2,428	844	1,584	***	***	***	***	***	***	***	12,140.00	.....	
Total	1,785,613	511,518	1,287,784	624,660	62,143	27,516	6,793	7,523	30,856	321,241	$11,497,678.36	11,180	

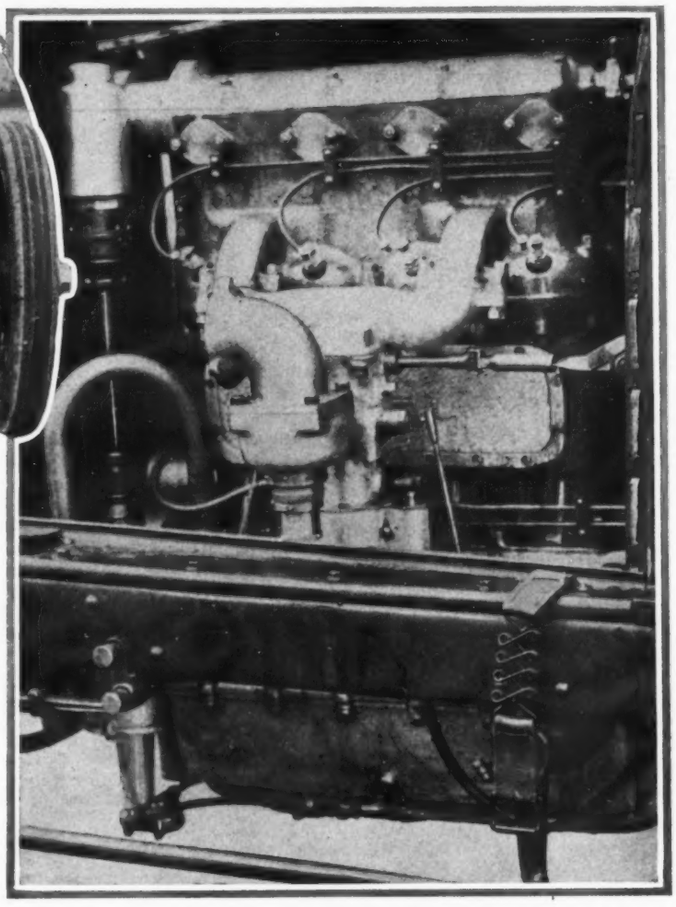
NOTE.—3,300 steam passenger cars and 300 steam trucks included. *Number of cars belonging to residents of other states. **Number cars re-registered owing to change of ownership, etc. ***Not listed separately by registration officials. †Registrations low under new law. ††Figures from Auto Directories Co., N. Y. †††G. R. Lamson, Librarian, Firestone Tire & Rubber Co., gives 2,777 for Louisiana, with 22 counties not included. He is the authority for the Mississippi figure 3,894. C. D. Ensign, B. F. Goodrich Co., also records 2,777 Louisiana registrations. He is the authority for the number of trucks in District of Columbia and his Mississippi figures correspond with those of Mr. Lamson. §Registration law runs from July to June §§Statistics by Dallas Chamber of Commerce. Electric car and truck statistics, where not given by registration officials, are from incomplete returns compiled by the Electric Vehicle Assn. of America.

Maxwells Designed for 105 M.P.H.

Aluminum Alloys in Chassis Minimize Weight in Cars for 500-Mile Race



Front view of the new 298.2-cubic-inch Maxwell racer now being tried out at the Indianapolis Speedway



Intake side of motor on Maxwell racer, showing overhead valve drive and mounting of carbureter and intake manifold. Note exterior air intake

COINCIDENT with the double victory of the Maxwell racing cars with Oldfield and Carlson at the wheels at Venice, Cal., last week, Ray Harroun, chief engineer of the Maxwell company and designer of the cars, comes forward with the details of construction of the three new Maxwells which will contend for honors at the annual 500-mile race at Indianapolis this year.

Generally speaking, the new chassis are of more elaborate design than the three that made up the Maxwell racing team which have been so successful all over the country this year. Much hand work is being put on them, and five Belgians are working in the racing car department with the other mechanics to make the cars as good for their purpose as Harroun knows how to make them. The Belgians are a new and interesting part of Harroun's domain. They are expert mechanics, careful, accurate and painstaking. One of them, expertly polishing a bearing, explained proudly that he had been in the battle at Liege, and due to a wound on his head was incapacitated for further war service. Somehow or other he got to this country and he is now working for Maxwell.

But to get back to the cars, they are similar in appearance, on the whole, to the past season's contenders, but have been altered here and there. To bring them within the 300 cubic inch piston displacement limit, the bore and stroke have necessarily been reduced, though the general motor design is much the same. The bore has been cut down from 4.2 inches to 3 3-4 inches, and the stroke has been lessened from 8 inches to 6 3-4 inches. These dimensions bring the displacement to just within the limit: to be exact, it is 298.2 cubic inches, as compared with the 445 cubic inches of the old cars.

75 M.P.H. for 200 Miles

Harroun has the first of the new cars running and it is being put through its preliminary paces at Indianapolis now, having been driven down about a week ago. On Saturday, the thirteenth, Harroun did some testing on his own account at Indianapolis, driving the car at an average of over 75 miles an hour for 200 miles. He expects 95 miles an hour out of these new cars, and believes he may get 105.

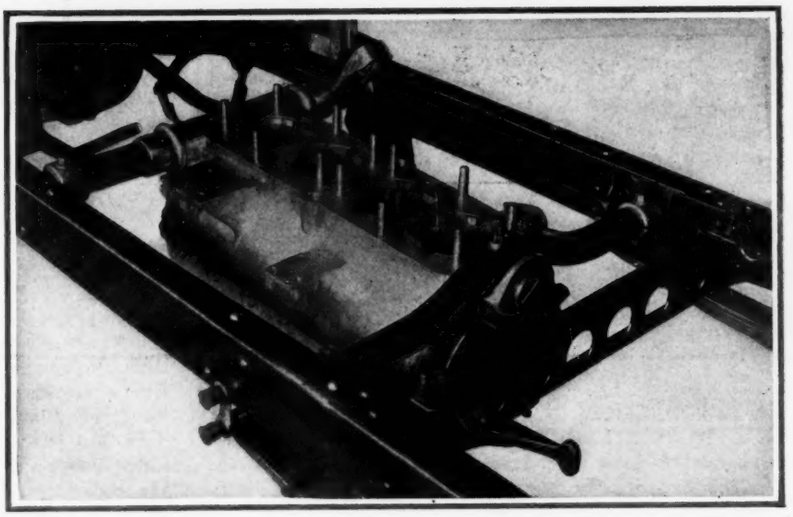
Motor Follows Maxwell Practice

The motor is still the offset overhead valve design which was used in the other cars. The camshaft is overhead, and the offsetting of the valves is made necessary in order to get both sets of cams on the one shaft. Drive for the camshaft is by a vertical shaft at the front end which has spiral gear connection with both the camshaft and the crankshaft. Those who have followed the design of these cars will remember the construction.

The most unusual feature of the engine is the crankshaft which this year, while preserving the counterbalanced design, is made in two halves, as shown in the illustration. No flywheel is used, but its effect is obtained by counterbalancing the shaft opposite to the throws; a feature that has been used in the old cars with a shaft of single piece design. The center bearing of the old shaft had to be a plain type, for it was impossible to get a ball bearing into place.

In the new design, instead of having only ball bearings at either end of the shaft as in the old type, splitting the shaft into two parts has made it possible to have a ball center bearing as well. Naturally many will say that it is objectionable to split the shaft, as it would be next to impossible to make a solid joint of the two parts, but this has been provided for by using a telescoping construction whereby one part slips within the other. Accurately to position these with respect to each other, there are four No. 8 Morse tapers to key the two parts together and then through the center is passed a 3-4 inch bolt which has a large head to cover the ends of the four tapers.

This makes a very accurate and solid connection, and effectively eliminates any bearing trouble here: the center bearing is a Fafnir No. 6,215.



Method of supporting the crankcase in the chassis. Note the integral rear arm through which the rear cross member passes, and the hanging of the front end

In further explanation of the counterbalanced crankshaft, it might be explained that the flywheel function is distributed along the entire length of the crankshaft and is conducive of fine engine balance. The counterbalance weight opposite each rod bearing is equal to the weight of the lower part of the rod and its bearing, thus the active forces are balanced with respect to the center of gravity and the centers of masses revolve in the same or parallel planes, vibration being reduced materially thereby.

The cylinders are cast in a block and the head carrying the valves, their rockers and the camshaft is detachable. Intake and exhaust passages are on opposite sides of the casting and they are large and free, so that the least possible interference with the passage of the gases to the manifolds is obtained.

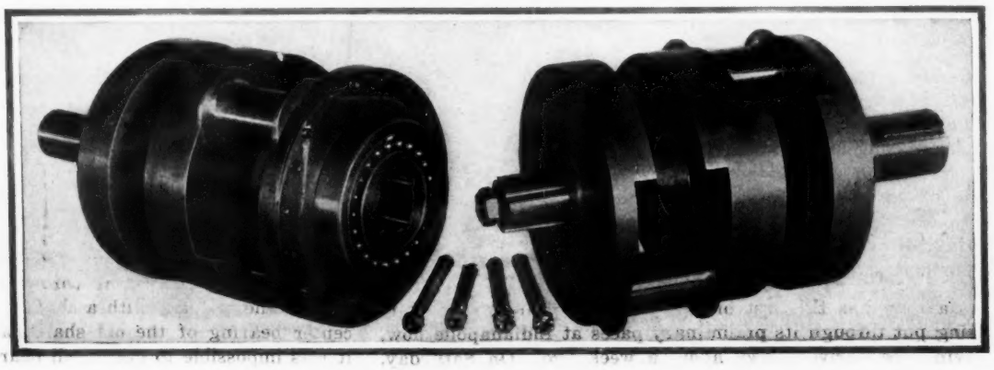
Lubrication Rearranged

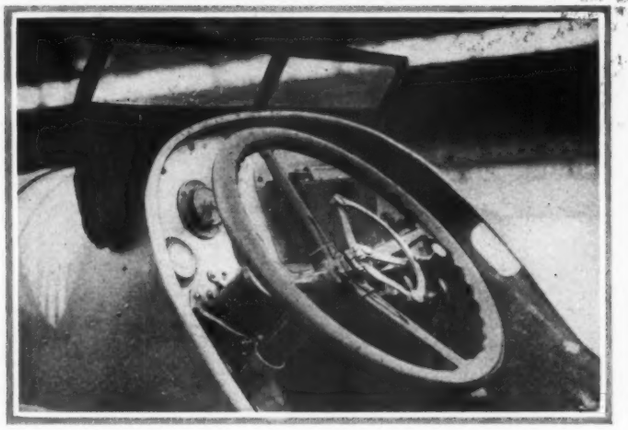
The oiling system has been entirely redesigned, so that instead of pumping oil out of the bearings, the cars are now fitted with a system which, though possessing many special features, moves in the conventional direction as it is a combination splash and force feed arrangement. Oil is pumped to each bearing by a McCord six-feed oiler with dash sight for each of these feeds. Three introduce the oil to the main crankshaft bearings, one goes to the camshaft and so on. This is the main system, and there is an auxiliary which works entirely by splash, the lubricant being pumped by hand to the splash troughs through a by-pass within reach of the mechanic. This latter is only for emergency in case the oiler fails to work. In ordinary operation, the oil is pumped to the reservoir of this oiler by the hand pump and is then forced to the points of use, but the by-pass offers a commendable means of sending the oil to the crankcase direct if needed.

In addition to this double arrangement, a separate pump alongside the main one is used to force oil to the rear end of the hollow camshaft. It goes through this and out by holes drilled in the cams, lubricating the rocker contact points. Surplus oil running out at the other end of the shaft and then to the gearcase, which has no connection whatever with the crankcase, a felt washer being placed between the two parts so that there will be no possibility of the oil of the different systems mixing. Of course, in driving, the lubricating of the camshaft requires only a stroke of the pump occasionally and it, being alongside the main supply pump, is no trouble to operate. Harroun backs up the new oiling arrangements with a guarantee against smoking and says that the cars will use less than 3 gallons of oil in 500 miles; only castor oil is favored.

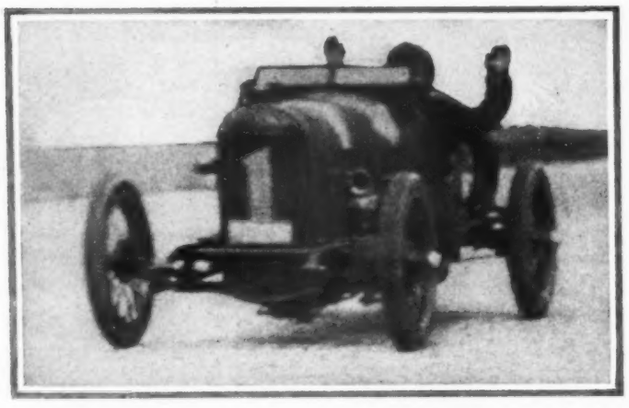
In lubricating the connecting-rod bearings, a unique method has been devised. Screwed to each counterweight is a disk, the function of which is to direct oil to the bearing by centrifugal force. The oil, coming under pressure to the three main bearings overflows from them and is caught by these disks which have a passage all the way around for the purpose. This passage widens at the hole drilled through the

Left—Piston and connecting-rod. Note oil scoop for emergency lubrication. Right—The counterbalanced crankshaft is split into two parts so that a ball bearing can be put in the center. The two halves are held together by four Morse tapers which accurately position them with respect to one another. In addition there is a 3-4-inch center bolt





Control features of Maxwell racer. Note isinglass windshield, a new idea in racing cars



Ray Harroun sending the new car over the Speedway at 90 miles per hour with his hands off the wheel to show ease and steadiness of steering with yoked spindle construction

counterweight to the rod bearing, and the effect when the shaft is rotating is for the oil to be thrown to this wider point, from which it escapes through the drilled hole into the bearing. The construction may readily be seen by referring to the illustration of the two-piece crankshaft: the disk is in position on the counterweight and behind the ball bearing. A similar one would be placed on the opposite counterweight so that the center bearing would take care of the two adjoining rod bearings. The other two oil disks would attach to either end weight and each would care for the adjacent rod bearing with the ball bearing of that end as the source of supply. Even at high speeds it is claimed that lubrication is ample.

Changes in Construction

Of course this change in the oiling system has necessitated some changes in the head construction as well as the crankcase, but in the main they are the same. Connecting-rods are still made of chrome-vanadium steel and have been subjected to accurate machining all over. The I-beam section is further strengthened by forging webs on either end of the section, making a very sturdy rod. The use of magnalium pistons is continued, magnalium being an exceedingly light and strong alloy which would no doubt find general use in motor car construction were it not for the expense. The piston heads are domed to give them strength, and each has five rings. There are two diagonally-split rings in each of the upper grooves and one wider ring below which is used as a retainer for the wristpin. The use of magnalium reduces the piston weight from over 2 pounds, the weight of a similar cast-iron piston, to about 15 ounces.

Cars Weigh Only 2,075 Pounds

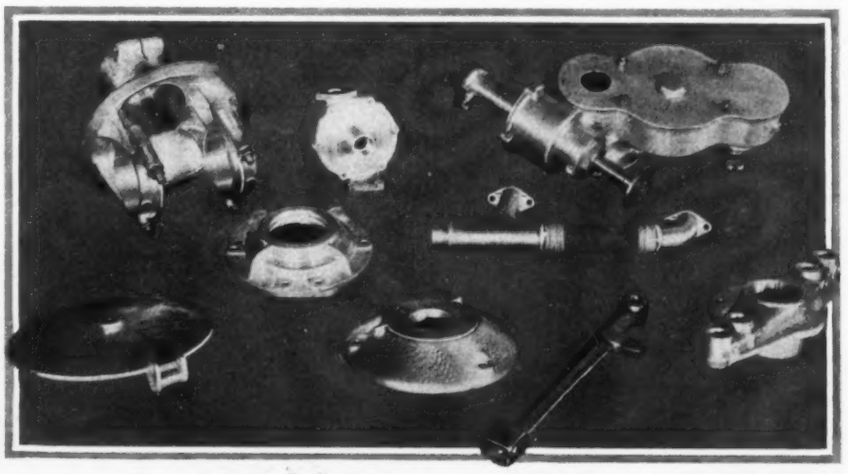
The new cars are actually about 290 pounds lighter than their predecessors: that is, the weight has been cut from 2,365 to 2,075 pounds. Several things are responsible for this: light alloy parts have been substituted for steel or iron wherever possible, the motor is smaller and lighter, and the front axle weight has been cut considerably.

In fact, the use of macadamite, which is a very strong and light aluminum alloy, has been quite extensive throughout the chassis. Roughly, about half the weight of a part is saved by using this material instead of steel, and it is nearly as strong. For instance, the brake drum spiders are now macadamite instead of steel, and thereby they are 5-pound parts as against an old weight of 10 pounds. The rear axle bevel gear carrier is macadamite—the cars use no differential gears. Among the other parts also made of macadamite this year are the housing for the front spiral camshaft drive, the fuel tank lid, the water pump, certain other parts of the rear axle and the water manifolds.

Windshield Reduces Eye Strain

The use of a windshield is also a new thing to racing cars. a shield with isinglass windows is attached to the top of the body cowl, and seems to have given excellent results, taking away much of the terrific eye strain which the racing driver knows so well. In trial, the shield has apparently made no difference in the car's speed, and in all probability will be used in the races. It has the advantage of allowing conversation between the driver and his mechanic.

Among other points of interest is the adoption of the Lemoine type of front axle, which design has principally to do with the method of mounting the spindle. Instead of the yoke end with a mounting for the spindle in the upper and lower arms of this yoke as in conventional practice, the horizontal steering spindle itself is yoked, and the end of the axle fits between, which is lighter and very strong. At the same time the swivel has been so positioned that the balance will be conducive to the utmost ease in steering.



A group of the macadamite parts of the new Maxwell racing cars which are a material factor in the reduction of the weight of the cars. Macadamite is an aluminum alloy of great strength

New South Wales' 1914 Imports $2,893,830

Increase of $231,455 Over 1913—United States Makes Large Gains—Is Only $4,200 Behind Great Britain in the Number of Chassis —Business Conditions in Australia Improving

THE import of automobiles into New South Wales has not been materially affected by the European war, according to the latest statistics from the Motor Traders' Assn. of N. S. W. The total value of motor vehicles imported in that state in 1914 was $2,893,830 compared with $2,662,375 in 1913, a gain of $231,455. The United States showed tremendous gains, the value of the American cars in 1914 amounting to $797,675 as against $663,760 in 1913, a gain of $133,915. Were it not for the war, these figures would have been even greater, as this country is the first to give delivery of the new year's models. It is easy to predict that many of the 1915 cars would have been in that state in December, and in that case, the United States would have shown the greatest amount of business.

Business Is Improving

Trade this year has improved to a wonderful extent. Wool is beginning to find a market and unless further restrictions are put on it there will be a fair sale for the same. Unfortunately the Government recently saw reason to prohibit the export of wool to the United States for the time being. However, this will not have any material effect on the popularity of the American makes of cars.

Some interesting figures are given in the accompanying table, showing the country of import and the country of origin. There was a decrease in 1914 of United Kingdom cars, that is, in the country of import column, but in the country of origin column there was an increase. The total value of cars imported from the United Kingdom in 1914 was $987,050, while the value of the British cars was $801,875, a difference of $185,175. The difference between the value of cars imported directly from the United States and the total value of American cars imported is $241,945, showing that a great number of the American cars came through the United Kingdom. Though the United Kingdom led the other countries in the value of chassis imported, the United States was a close second, being only $4,200 under the British imports, which were valued at $801,875, the American value being $797,675.

United States First in Bodies

The United States led in the imports of bodies, the value being $192,620, Great Britain being second with $147,415. The United States also showed a greater increase than the United Kingdom, the increase over 1913 being $21,895 as against the British increase of $8,820. The total value of bodies imported into New South Wales in 1914 was $444,205 as against $386,560 in 1913. The figures again show that many American bodies came through England.

New South Wales is one of the leading Australian states in the purchasing of automobiles, especially low-priced cars. The largest sales are made in the country districts where farming and pasturage constitute the chief occupations. With this class of population purchasing practically 80 per cent. of the cars, it is not surprising that the low-powered and medium-powered cars should lead.

Throughout Australia, with the exception of South Australia, the automobile trade is improving; stock values have recovered greatly since the reopening of the Exchange and, though the position is by no means the same as previous to the war, still people are beginning to spend money once more.

The demand for high-priced cars is small because of the new taxation which lately came into force, taxing individuals more highly. Added to general taxes that have the effect of raising the cost of living, there are special automobile imposts varying from $10 to $50 according to size. In the truck field things are particularly bright, since the large number of users who have lost their vehicles to the government will buy anything capable of doing the work.

Imports of Chassis and Bodies into New South Wales in 1914

Chassis

Country of Import.	1913	1914	Country of Origin.	1913	1914
United Kingdom	$1,011,330	$987,050	United Kingdom	$789,495	$801,875
Canada	286,885	528,055	Canada	220,325	338,480
Ceylon	.....	1,020	New Zealand	.....	50
Fiji	.....	10	Austria	1,700	1,210
India	.....	3,045	Belgium	49,115	58,185
New Zealand	11,800	35,980	France	240,105	184,790
South African Union	385	.....	Germany	148,225	156,875
Straits Settlements	95	.....	Italy	143,395	110,575
Austria	1,700	.....	Netherlands	2,200	.....
Belgium	142,770	124,020	Sweden	3,545	.....
France	45,245	20,670	Switzerland	3,950	.....
Germany	127,730	104,550	U. S. A.	663,760	797,675
Hawaiian Islands	2,400	.....			
Italy	108,525	89,495			
Sweden	1,700	.....			
U. S. A.	525,250	555,730			
Totals	$2,265,815	$2,449,625	Totals	$2,265,815	$2,449,625

Bodies

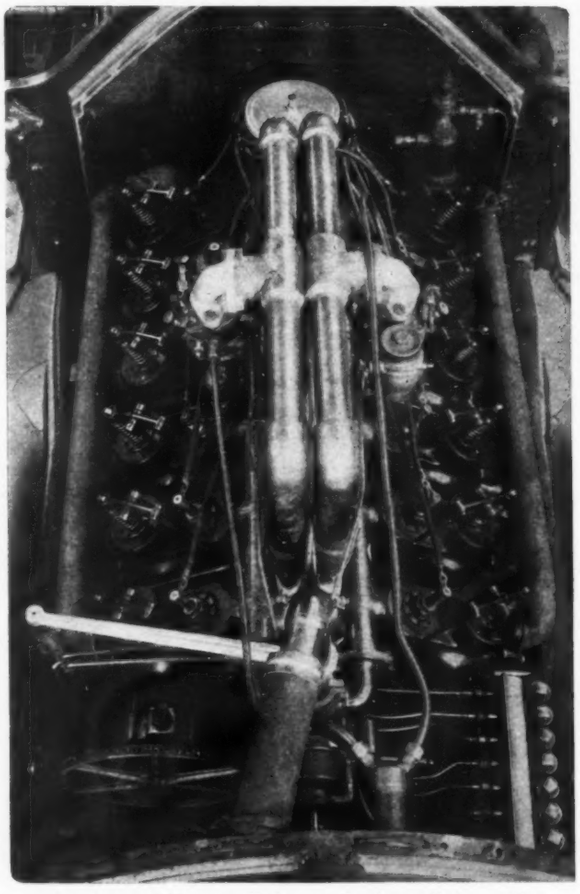
United Kingdom	$151,305	$151,100	Commonwealth	$825	....
Canada	62,570	127,030	United Kingdom	138,695	$147,415
Ceylon	....	140	Canada	48,150	75,660
Fiji	....	4,410	New Zealand	275	225
New Zealand	3,075	7,530	Austria	....	....
South African Union	85	....	Belgium	140	1,135
Belgium	11,830	5,780	France	17,960	6,950
France	1,670	570	Germany	7,595	11,955
Germany	6,975	8,565	Italy	1,740	8,245
Hawaiian Islands	400	....	Netherlands	455	....
Italy	1,215	6,695	U. S. A.	170,725	192,620
U. S. A.	147,435	132,385			
Totals	$386,560	$444,205	Totals	$386,560	$444,205

Schebler Has Veteran Twelve-Cylinder

Motor Constructed in 1908 Has Carried Old Chassis Over 30,000 Miles—Unusual Connecting-Rod Design

IN 1908 when many of our manufacturers were experimenting with sixes and building successful fours, George Schebler of Wheeler & Schebler, Indianapolis, Ind., maker of Schebler carbureters, designed and successfully built a twelve-cylinder V-type valve in the head motor with cylinders set at 45 degrees. Since the time of its construction, which was done under Mr. Schebler's direction by Philip Schmoll of the engineering staff of the company, the motor has pulled an antiquated automobile chassis over 30,000 miles. Mr. Schebler has many hobbies, and this twelve-cylinder motor which is still giving service is one of them.

But this twelve can very conveniently be transformed into a double six, operating on either the right set of six cylinders or the left set, causing the machine to run little different from an ordinary six-cylinder. Thus, at will, the driver can use either one of two six-cylinder motors, or both, so making it a twelve-cylinder power plant. Two carbureters, Scheblers of course, are used, and these may be controlled independently or together. Mr. Schebler in using the machine employs six cylinders when the roads are good and no difficulties are met with and twelve when a sand pit is encountered or when the car is required to pull through deep mud.



Plan view of V-type, 45-degree, twelve-cylinder motor mounted on old chassis

Unusual Connecting Rods

In these days when the eight-cylinder motor is attracting a great deal of attention, some of the mechanical details of the Schebler twelve should command the consideration of the motor enthusiasts. This will be especially true in the matter of connecting-rod design, since the engine is of the V-type. In our present eights two type of rods are used, the yoked and the side-by-side, but the Schebler twelve uses neither. Instead, one long rod is employed and a shorter one attached to it on the bearing cap, by means of a steel pin, as shown in the illustration herewith. This means that the large rod is almost the same as the conventional type except that on one side and near the I-beam section there is provision for coupling a forked rod by means of a steel pin, which forms the bearing for the small rod. The present motor uses rods made of bronze, the larger 9 3-16 inches long and the smaller 7 1-2 inches.

The crankshaft is not startling in design, being similar to that of a six-cylinder shaft using seven main bearings. These are 2 inches long and 1.75 inches in diameter. The crank pin bearings, plain like the main bushes, are 1.5 inches in diameter and 2 1-2 inches long. Directly above the crankshaft is a camshaft with twenty-four cams, each operating a roller push rod directly, and these push rods are extended angularly to operate rocker arms. However, between the valve tappet and the valve stem is a finger, such as is used on a few valve-in-the-head motors, to allow the valve stem to take a direct thrust instead of one at an angle.

Flat Valves Best

During the early stages of the development of this motor 45-degree valves were used, in accordance with convention, but because of excessive valve trouble due to warpage the designer turned to flat heated valves and while a little valve trouble was encountered for a while, it has recently been slight.

The Schebler twelve has a bore and stroke of 3 1-4 by 5 and up to this time no dynamometer test has been made of its power output. On the road exceptional power and speed is shown and, according to Mr. Schmoll, no one has had the courage to keep both throttles wide open for any length of time.

Ignition of this motor is by a Mea magneto of the six-cylinder type fitted with a Schebler-made twelve contact distributer, while the armature is, of course, operated at three times crankshaft speed. There is nothing unusual in the timing, it being just like a six-cylinder motor firing 1, 4, 3, 6, 2, 5.

Novel Oiling System

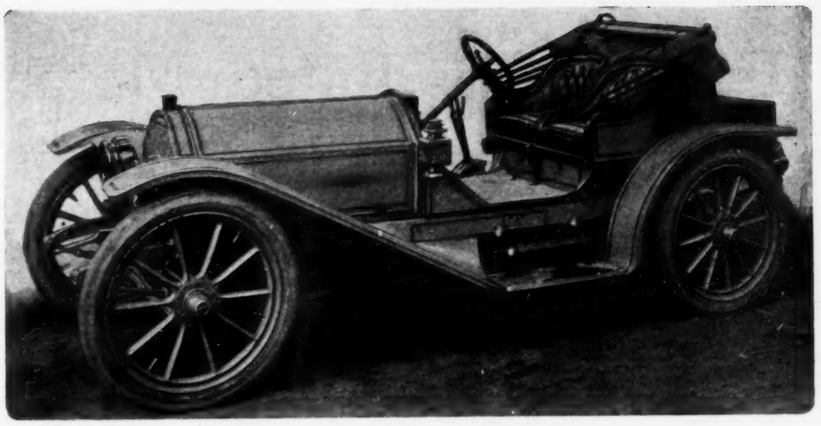
There is a slight deviation from common practice in the oiling system, as a large plunger pump operated from an auxiliary shaft forces oil through pipes to the main bearings, and directly to the cylinder walls which are drilled for the purpose. These holes are drilled so low that they are never uncovered by the pistons. Besides the force feed, splash is used for the rod bearings, etc., there being six troughs the overflow from which falls to a sump whence it is again picked up by the pump and recirculated.

Nothing unusual is seen in the cooling system, a centrifugal pump being used.

As one would expect this twelve-cylinder engine has a very

light flywheel, its weight being between 30 and 35 pounds; the rapidity of firing being such that a heavier flywheel is not needed. The motor weight is greater than that of a six but its length is only 40 inches overall.

At present there is being designed another twelve-cylinder motor somewhat similar to that now in use, but this new one will be a 3 3-4 by 5 1-2 and will have the valve push rods vertical, instead of at an angle of 45 degrees as in the present type.



George Schebler's twelve-cylinder car. For ordinary running six cylinders suffice, but under difficult road conditions the other six are called into service

A Winton Twelve

The Winton company at one time made up a special twelve-cylinder job for a motor boat. It was composed of three four-cylinder motors of the same size and style as those used in the old model A Winton in 1905. The cylinders had a bore of 5.25 inches and a stroke of 6 inches. The motors were practically independent, each having its own flywheel and magneto but only one water circulating pump was used for the entire battery of motors. The crankshafts were connected by Oldham couplings. All other features of the motors were the same as those used on the Winton cars.

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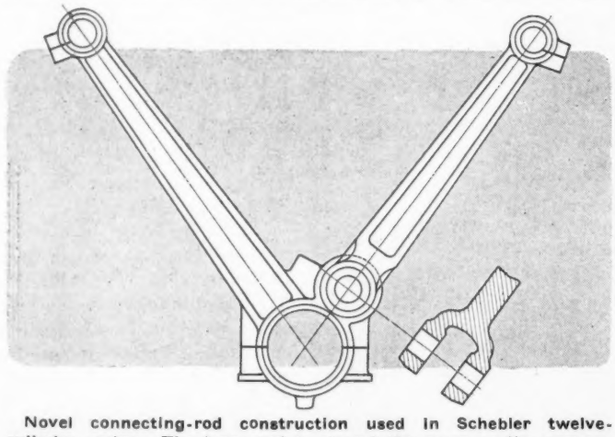
Two Improvements Devised for Motor Spirit Process

TWO improvements have recently been suggested by chemists of the Standard Oil Co. of Indiana in the equipment for running the Burton process for producing motor spirit. One of these introduces two long leaves of steel running the length of the still on either side and hinged to the wall at the center. These leaves form a bridge across the lower part but can be swung up against the top of the still when it is to be cleaned. The reason for its use is to catch the free carbon in the distillation of the oil. This carbon heretofore has been deposited on the bottom of the still, forming a heat insulation layer, thus causing the apparatus to be burned out in a short time. When the steel leaves are covered with carbon they can be swung to the top and readily cleaned.

This improvement has been suggested by Robert E. Humphrey, of Whiting, Ind., and in his patent application Mr. Humphrey states that, "In commercially practicing the Burton process on a large scale wherein the capacity of the still and the quantity of the material treated is several thousand gallons, it is found that the accumulation of carbon on the still bottom precludes conducting the run long enough to convert into gasoline more than about one-third of the material contained in the still. This is because the carbon, being a good insulator of heat, becomes red hot, and, if the run were continued, would soon burn through the bottom of the still. Beside the destruction of the still itself the layer of carbon heat insulation at the bottom also tends to retard the progress of the distillation. A primary object of the invention is to prolong the run to an extent that will enable two-thirds of the still contents to be converted into gasoline without incurring the objectionable consequence referred to."



Novel connecting-rod construction used in Schebler twelve-cylinder motor. The large rod is almost the same as the conventional design except that on one side and near the I-beam section there is provision for coupling a forked rod by means of a steel pin, which forms the bearing for the small rod. The rods are made of bronze in the Schebler motor, the larger being 9 3-16 and the smaller 7 1-2 inches

A Mechanical Pressure Regulator

The second improvement suggested for the Burton process in the patents applied for by Francis M. Rogers, and Thomas S. Cook, both of Whiting, Ind., and assignors to the Standard Oil Co. of Indiana, consists of a mechanical regulator which will govern the high pressure maintained in the still. This pressure is around 80 pounds and the contrivance is so devised as to feed to, or release from, the still, a sufficient amount of gas to keep the pressure even.

As explained in the patent papers, "It is now understood that in the manufacture of commercial gasoline from high boiling point hydrocarbons, such as the product commonly known to the trade as fuel oil, it is of the utmost importance to maintain perfectly constant and uniform conditions, particularly in matters of pressure. Since variation will produce changes in the character of the distillate produced with consequent undesirable irregularities in output, the present device is particularly designed to maintain this pressure absolutely constant. Tests have shown it to be thoroughly satisfactory for the purpose."

It will readily be seen that in order to secure anything like uniform results from the volatile and complicated gases in the still approximately uniform pressure must be maintained throughout the process of distillation.

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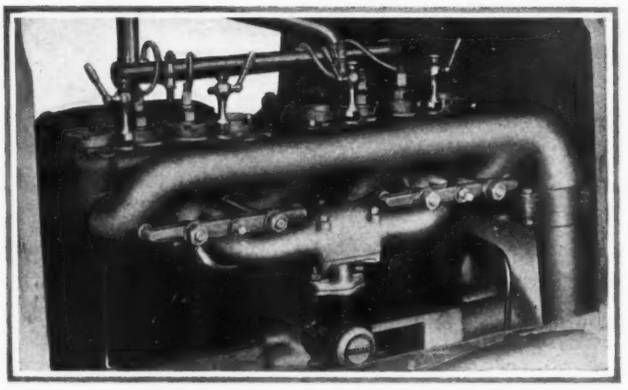
Detroit Adopts Traffic Signal

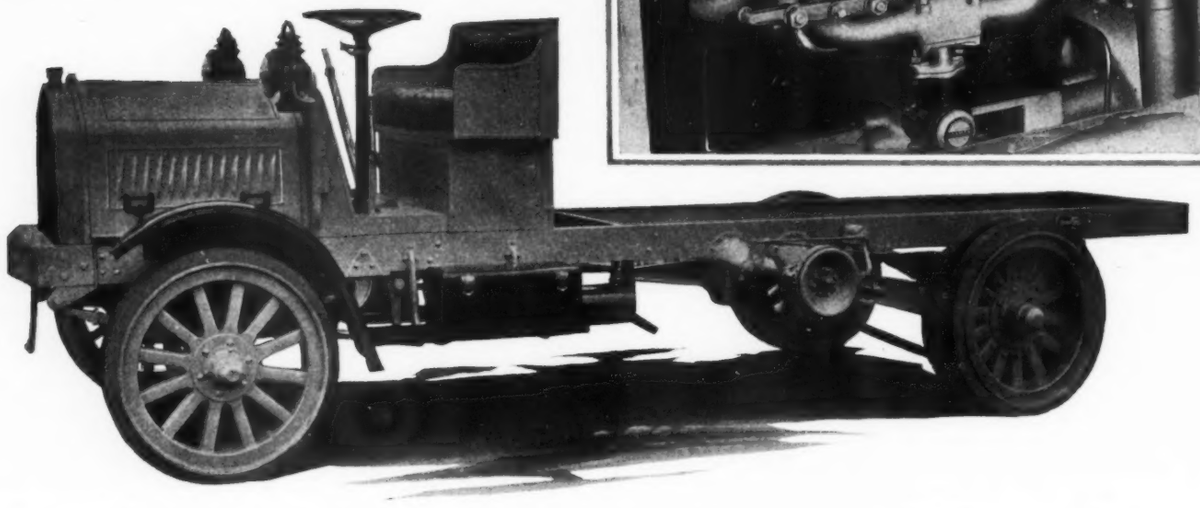
DETROIT, MICH., March 20—The police department has adopted definitely the traffic signaling device which was invented by secretary Walters of that department and tried out for the last 3 weeks. The device, as described in THE AUTOMOBILE for March 4, consists of removable posts surmounted by two metal cross plates, one with a red background and the other with a green background. Upon the former is the word Stop and upon the latter the word Go, both in white. At night an oil lamp surmounts the top of the post and throws either a red or a green light according to whether traffic should stop or go. A handle connects with the two cross-plates and thus the traffic man can regulate traffic very easily. These posts cost only $4.

Four New United Motor Truck Models

2 and 3 1-2-Ton Are Worm-Driven and 3 and 5-Ton Use Chains



Right—Side view of Continental motor used in United trucks, showing manifold design
Below—The new 3-ton, chain-driven United truck



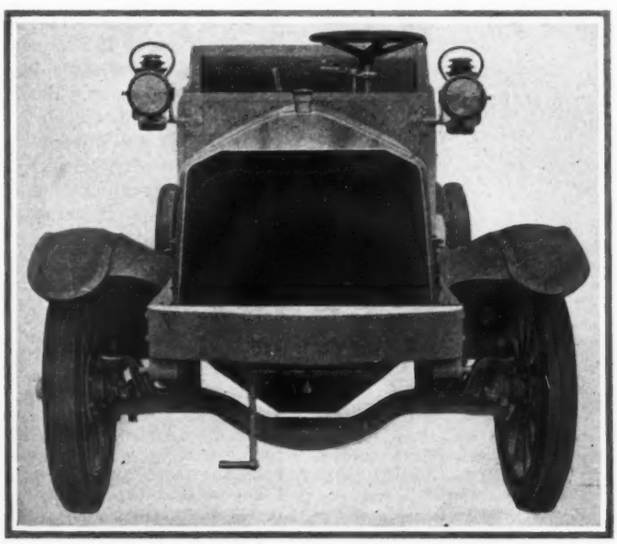
PRELIMINARY announcement of the formation of the United Motor Truck Co. in Grand Rapids, Mich., was made about the first of February, but the specifications of its commercial cars were not available at that time. There are four models in the new company's list. These are a 2-ton worm drive, a 3-ton chain drive, 3 1-2-ton worm design and 5-ton chain type. So far as possible the designers have endeavored to standardize the four models so that parts are interchangeable throughout the line. This has a tendency to make the smaller model slightly heavy for its rating, but that is rather to be looked upon as a desirable feature since the company claims no extravagant use of tires or fuel as a result.

The trucks are assembled from parts of well-known makers. Motors are Continentals, axles are of Timken make, the worm final drives are from the Timken-David Brown factory, Brown-Lipe gearsets and clutch units are fitted, Perfection springs, Mayo radiators, Gemmer steering gears, Spicer universals, Whitney chains and Hayes body parts are all used in the make-up of the United trucks.

The price of the 2-ton is $2,050; of the 3-ton, $2,750; of the 3 1-2-ton, $2,950; and the 5-ton is offered at $3,400. These figures are exclusive of body but with driver's cab fitted.

The 2-ton model uses the 4 1-8 by 5 1-4 size of Continental engine. This is a conventional L-head type provided with three-point chassis suspension and carrying an S. A. E. horsepower rating of 27.23. It is cooled by centrifugal pump, has Eisemann fixed spark ignition, splash oiling and Stromberg truck type of carbureter. All of the other models use the 4 1-2 by 5 1-2 Continental which is also an L-head design, features of which are similar to those enumerated for the other engine. The spark advance is automatic, however.

The 2-ton model follows standard design throughout. The gearset, in unit with the engine, gives three forward speeds and reverse and provides center gearshift. The gears and shafts are nickel steel, and Timken bearings carry them. Then back of this unit, the power is transmitted through one of the two Spicer universals to a 2 1-2-inch tubular shaft which in turn gives its power to the worm rear axle through the intermediary of the second universal.



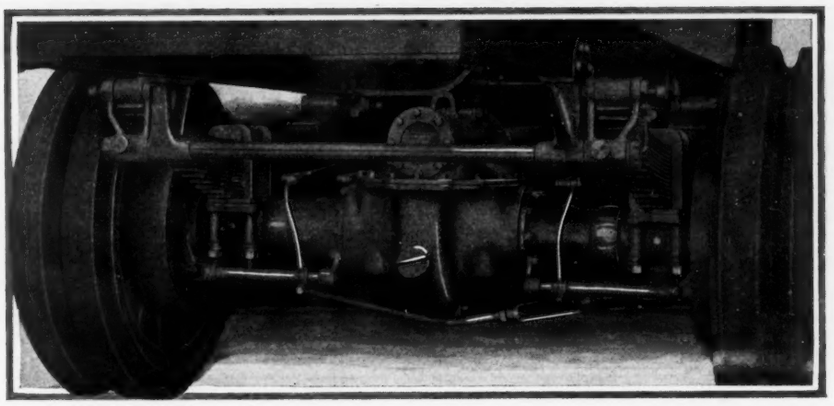
Front view, showing swiveled crank bracket

The rear axle is floating and has the overhead form of worm gearing. The reduction from motor to wheels on high gear is 9 1-4 to 1. Springs are half elliptics of regular truck form. The front pair measure 44 inches long and are 2 1-4 inches wide, while the rears are 3 inches wide and 56 inches in length. The rear spring shackle bolts are 1 inch in diameter and the spring eyes have bronze

bushings to bear against these bolts.

The wheelbase of the 2-ton is 148 inches while front tread is 56 inches and rear 58. The tires are 34 by 4 in front and 36 by 4 dual in rear. To give an idea of the loading space, the length of frame back of the seat is 120 inches and the clear space between the rear wheels is 52 inches. A governor is fitted, and may be adjusted for maximum speed of either 10, 12 or 15 miles an hour.

The same general construction is adhered to for the other worm drives as for the 2-ton briefly described above, and the chain types employ the familiar construction whereby the drive shaft from the engine runs back to a jackshaft with a differential as a part of it. From this point the delivery to the wheels is through the Whitney chains on the sides, the rear axle being a dead type.



Rear view of 3 1-2-ton United truck, showing worm-driven axle and rear spring construction

On the 3 1-2 ton worm model, the Timken-David Brown axle has a gear ratio of 10 1-3 to 1. In this model as well as in the 2-ton, the drive and torque is taken by the springs. The springs are so designed as to be flat under rated load, thus driving in line. At this time, the drive shafting from motor to back axle is in one plane, making for efficient power transmission. The brake rods then are also in line.

The 3-ton chain and 3 1-2-ton worm models have 36 by 5 tires, dual in the rear. The tread is 72 inches rear and 65 inches front. There are several wheelbase and body space options to meet the requirements of different service. The standard is 144 inches, but 120, 168, 192 and 216-inch lengths are available, the first two of these costing $50 more than list and the last two $100 more.

Although the 5-ton has 36 by 5 front tires, its dual rears are 40 by 6. However, the wheelbases are the same as the two just mentioned, with 120-inch as the standard. Its general design, though heavier, follows that of the other models.

Concern Has $200,000 Capital

The concern is a Michigan corporation with a capital stock of $200,000, and has for its head F. T. Hulswit, president of the local railway and light company, while E. M. Elliott, who for several years has been connected with the industry is the secretary and general manager.

The concern is now getting under way; is placing dealer agencies and is said to be progressing at a lively rate.

New Ford Assembly Plant in Indianapolis

Schedule of Regular Output To Be Sixty Cars a Day

The accompanying illustrations show the exterior and a portion of the interior of the new Ford assembly plant at Indianapolis, Ind. The plant is a four-story fireproof structure containing 200,000 square feet of floor space and has only recently been put in operation. It is planned to completely assemble 8,300 cars by July 1. A unique part of the interior arrangements shown herewith is that the freight cars containing the incoming material are run directly into the building and the cranes from above lift the supplies on the freight cars to the various assembly and supply departments on the upper stories. When this plant, which was opened officially on March 9, is operating to its capacity, more than sixty cars a day can be completely assembled ready for shipment to the territory handled through the Indianapolis plant.

Automobile section of an aviation squadron. New motors, propellors, etc., were taken to the front by 3-ton trucks with canvas bodies

Cars and Trucks Behind the Lines

Wide Range of Usefulness—Searchlight Cars, Transport and Supply Convoys and 45 Vehicle Tractor Trains—Cooking in Traveling Truck—All Painted Battleship Gray—Novel Equipments

By W. F. Bradley
Special Representative of THE AUTOMOBILE *with the Allied Armies in France*

PARIS, March 5—The town was not within sight of the trenches and not even within sound of rifle fire. It worked by day and it slept by night to the dull boom of the cannon, and so highly developed had become the ears of the inhabitants that they could not only forecast but supplement the official war reports with considerable accuracy. But this town was more than a public long distance telephone to the battle front. Being on the main line of communications, all the automobile traffic to the front passed through it, and by examining that traffic a better idea could be obtained of the general situation than was possible in the front line of trenches. At the front everything is hidden and secretive; men and officers obey orders without knowing or seeking to know the why and the wherefore of them. Nobody asks questions for there is nobody willing to reply to them.

Searchlights on Eight-Cylinder Chassis

It is impossible to stay in this town without realizing the diversified nature of the work done by the automobile. Even the extensive user of automobiles is apt to fall short of his conception of the range of work undertaken by mechanical traction. A fleet of automobile searchlights, manned by marines, paid us a visit. Six vehicles formed a working section. While the chassis were alike, all of them being eight-cylinder De Dion Boutons, with cylinders of 75 by 130 millimeter bore and stroke, their equipment varied. Originated in France, the eight-cylinder motor has not met with the general approval of French manufacturers or the European public. De Dion Bouton is the only firm making this type of motor as a stock touring car proposition and it is only being used in the army for touring car work and these special automobile searchlights.

The leading vehicle in the convoy is fitted with a platform body covered with a green canvas top. It has aboard the officer in command of the section, half a dozen men, and a reserve supply of food and ammunition. In addition to its acetylene headlights and its oil side lamps, it has a very powerful electric searchlight pivoted on the dashboard. This is the only use of electricity for the automobiles themselves. Most of the night driving has to be done in complete darkness, for the showing of any light might be an important indication to the enemy. An easily controlled electric light at the disposal of each driver might result in it being used at undesirable moments; thus one powerful light at the head of the column is all that is required for general safety. The duty of the driver on the road at night is merely to follow the outline of the car ahead.

The rear vehicle has also a closed canvas body and forms a workshop and general stores for the section. The tools are sufficient to enable all ordinary repairs to be carried out in the field, whether those repairs be to the mechanical or electrical part of the outfit. The four electric searchlights are of an entirely new type. In addition to the eight-cylinder motor driving the car, there is a separate four-cylinder motor direct coupled to a dynamo, and mounted under a bonnet on the car platform. The radiator is at the rear, and is one of the circular coil tube type as used on the Paris motor buses. Naturally its capacity is proportionally greater than that of a car radiator, for its position gives it no direct current of air, even with the automobile under way.

Back of the driver's seat, and between him and the gasoline-electric group, is the electric searchlight mounted on a forked pivot so that it can be swiveled in any direction. The searchlight is not intended to be taken off the automobile, and in consequence is raised a sufficient height for it to cast its rays above the heads of the crew and over such natural obstacles as wayside hedges. Four men are carried aboard each automobile. They comprise the driver and a companion sitting by his side, also two men sitting one on each side of the gasoline-electric group, facing forward, with their seat practically over the rear mudguard. Every inch of space is used to the best advantage, so that while the six must operate together to do the most useful work, no vehicle is likely to be stranded if left alone to work itself out of a difficult situation. Gasoline is carried under the seat. The kit of each

of the four men has to be carried on the car. This comprises the regulation knapsack, sleeping blanket, new pair of boots, and 2 days' reserve rations. The whole forms a compact bundle which can be slung on a man's back at a moment's notice, if it becomes necessary for him to leave the car, but it is sufficiently big to take up an appreciable amount of space on an automobile.

Complete Tool Equipment

Spare gasoline, oil, tubes, tools and automobile parts, as well as carbide for the side lamps and headlights, are contained in lockers around the body of the automobile. The gasoline for the small motor is in a separate tank built into and forming a part of the bonnet covering the small four-cylinder motor. On a sloping board at the rear of the automobile, and just below the second radiator are leather cases to hold respectively a saw, hammer, shovel, and pick. A coil of rope is also attached to the rear. These tools have their handles projecting from the cases so that they can be picked up without the loss of a second. It would fall to the lot of the soldiers on the side of the car to make use of them first if obstacles had to be cleared away, or if the automobile became bogged. The position of these men makes it possible for them to jump down and seize the tools with the fewest possible motions.

Invisibility is secured by painting every part of the automobile and its equipment a grayish green, including the waterproof cover over the searchlight. The canvas cover over the bodies of the first and the last vehicles are also of green. This is found to be much less visible than the khaki tint adopted by the British army; indeed, in the English motor service khaki is giving way to battleship gray. Single pneumatics are used in front and twins in the rear. No armor plating is used on the cars.

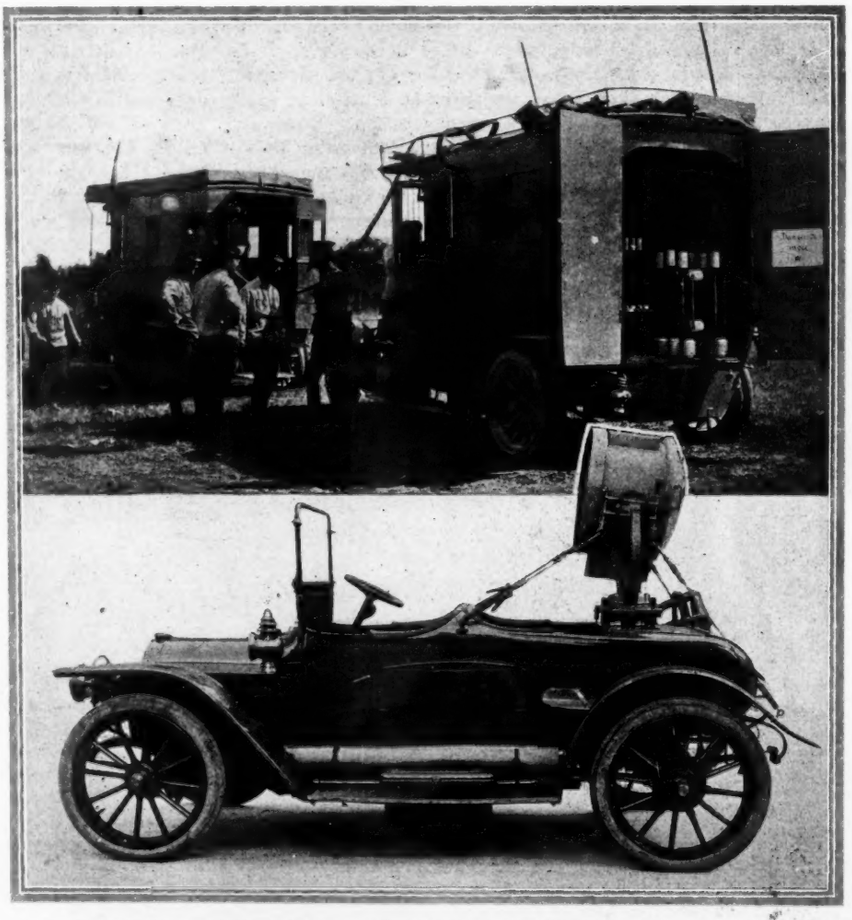
More automobile searchlights appeared. Only one of these was of a new type. It had a light steel telescopic tower normally lying horizontally on the top of the platform body, the latter being provided with rails to enable the tower to be placed on the ground with great rapidity and opened out by steel cables and pulleys. The searchlight was permanently attached to the topmost section of the tower, and thus went up with it, or could be used direct from the top of the car. This outfit enabled the searchlight to be hoisted to a height of 40 feet from the ground in about as many seconds and to be brought back and placed in position on the automobile in about the same length of time. The feature of the design lay in the rapidity of operation with the use of only two men for the searchlight and two for the automobile—a crew of four in all. Taken to a height of 40 feet, most natural obstacles could be cleared, cottages, trees, bushes, etc., while at the same time the observers could remain in a zone of safety. Electric long distance controls enabled the searchlight to be manipulated at the top of its tower with the same degree of accuracy as on the automobile platform. A single motor was made use of on this type of machine, this being a four-cylinder model carried under the driver's feet.

The most commonly employed automobile searchlight is one having a four-cylinder motor for both the dynamo and the propulsion of the car, and a searchlight mounted on a light steel frame with pneumatic tired wheels. This can be used from the top of the automobile or run down steel rails, normally carried under the platform, placed in the desired position, and operated from a distance.

A convoy of American trucks—3-ton Whites—passed through town. They were being used for taking fresh men from the depots in the rear, setting them down within half a mile of the trenches, and taking back the unshaved, mud-stained soldiers who had completed their period at the front line. All this work had to be done at night and without a single light being shown. In an hour men who had been living amid mud and water for a week could be in some town 10 miles away where a bath, good and regular food and clean straw beds could be obtained for all. In 2 hours they could be 20 to 24 miles from the actual scene of fighting, and it was not an uncommon thing for the men to be brought back this distance in order to relieve the somewhat congested villages just to the rear of the firing line. Canvas camps are unknown to the French army. The men are housed in all kinds of buildings, varying according to circumstances from comfortable bedrooms to partially wrecked sheds.

American Trucks Behind Firing Line

Before the American trucks went into service many of them were slightly modified. The yellow canvas tops of some makes were far too visible for work in the military zone. Thus they were painted a dull gray throughout. The



Upper—Wireless telegraphy outfit as carried on a special motor truck for the use of the French army. Lower—One type of large automobile searchlight for military purposes, the Sautter-Harlé

extension top over the driver did not always afford sufficient shelter. This has been brought further forward, lower, and has been completed by canvas sides. In many convoys a higher dash has been fitted so as to completely cover in the steering column and wheel. This is easily done by a steel tube frame over which canvas is laced. Most of the trucks now have a partition back of the driver's seat. Without this the driver as well as the soldiers who are being transported are placed in a strong current of air. An airtight partition, with a mica window in its center, placed behind the driver, makes a remarkable difference to a truck both from the standpoint of the driver and his passengers.

Individual Equipment a Feature

A convoy of twenty-two Delahaye trucks came into town. They had been in service for several months, and consequently had lost much of their original smartness, but this was more than compensated for by the practical and ingenious fittings the individual men had worked out for themselves. Just as a touring car coming direct from the maker is very rarely equipped in a way to suit the experienced motorist doing a lot of cross-country work, the average truck designed to work in town or from a fixed depot is lacking in a score of little things necessary to follow an army in the field.

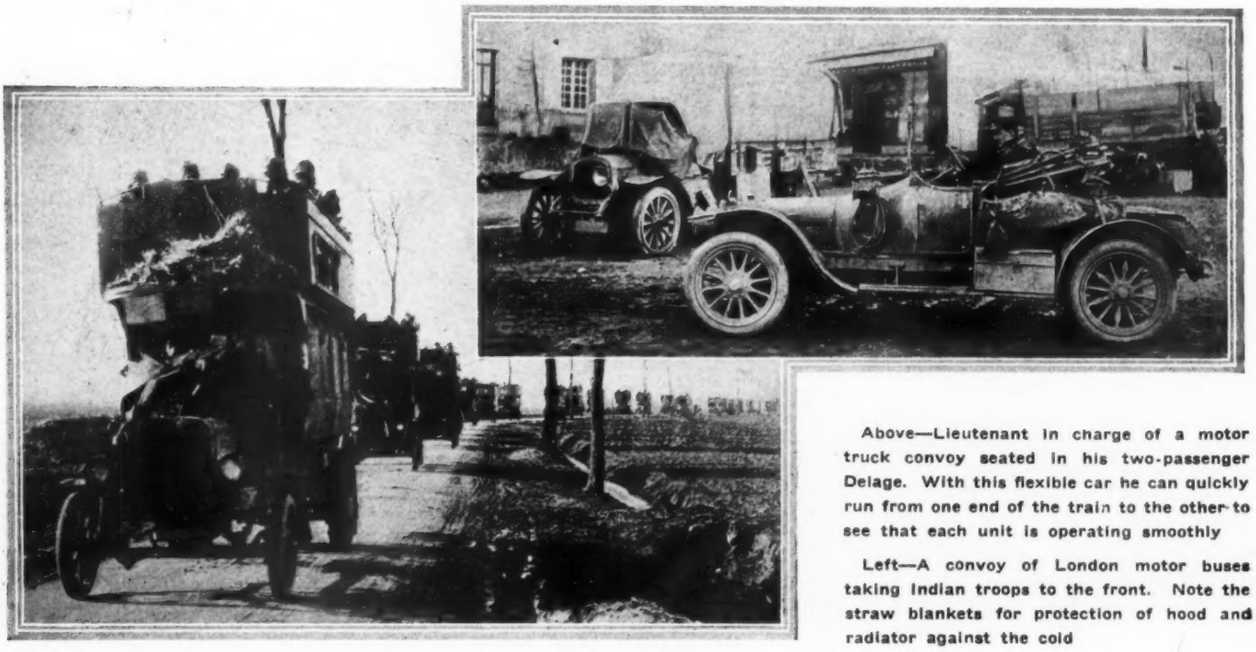
As an example, these Delahayes had gone out with the standard French army type body, which is a platform with movable sides and top and separate top for the driver and his companion. They were told off to carry fodder for horses; this meant a 20-mile trip from a railroad depot to the town where the cavalry were quartered, and a return the same day. The bodies had to be modified for this work. The canvas tops were taken off, although the hoops were left in position, and the wood sides were raised a couple of feet. Here the advantage of a separate hood for the driver made itself felt, for with this latter, whether the truck was used open or closed, the driver always had protection. However, the protection afforded was rarely sufficient for winter work. The men got over this by lowering the tops so that there was but a small amount of head clearance when they were seated. Although the dash on the Delahaye is much higher than the bonnet, it is not sufficient protection. The men got over this by fitting either a canvas or a wood extension. Side doors made out of packing cases or any other available wood were also fitted. The most suitable arrangement would be canvas extension for the dash and canvas side doors mounted on steel tubes, thus rolling away in small space when not required.

No Protection from Cold

Very few trucks afford sufficient space for tools and spares. The regulations stipulate that there must be big capacity lockers placed under the overhanging portion of each side of the body. These, however, were not always fitted, or not in sufficient number and size, and were supplemented by lockers made by the men. A ladder is a very useful equipment for a truck. It is conveniently carried fastened along the side of the body. Protection of the bonnet and radiator against cold is never thought of by the manufacturer, although it is an important consideration in active service. The men in this convoy had overcome the difficulty by the use of straw blankets commonly used by gardeners. One blanket made to the correct size completely covered the bonnet and was held down by a couple of straps or two pieces of rope. A second was shaped to fit over the front of the radiator. These blankets cost little to make, they were obtainable almost anywhere in the country and could be replaced readily. While they were not always required for running, they were convenient as a protection at night. When the frost was particularly severe water was drained out of the radiator, gasoline pipe disconnected and float chamber drained, then a small spirit lamp placed under the bonnet. With the straw covering over everything, a motor treated in this way could be started up easily in the morning. The use of the lamp and straw blankets in many cases made it unnecessary to empty the radiator.

The best way of carrying spare gasoline is in one of the 5-gallon galvanized iron cans used by gasoline refiners. One of these is attached under the rear of the body by two flexible steel bands, with nuts for tightening them. They are readily changeable for a full can, and as there is a plug near the base and in the head, air is conveniently admitted to facilitate drawing off gasoline. One repair shop traveled with the convoy and was capable of keeping the entire fleet in running order. Externally this vehicle did not differ from the others, except that it always had its canvas cover in position. Inside it had a stout workbench, vise, portable forge drills, a good assortment of hand tools, and all the spares likely to be needed.

In charge of the convoy was a lieutenant aboard a 12-horsepower two-seater Delage car. This was an ordinary



Above—Lieutenant in charge of a motor truck convoy seated in his two-passenger Delage. With this flexible car he can quickly run from one end of the train to the other to see that each unit is operating smoothly

Left—A convoy of London motor buses taking Indian troops to the front. Note the straw blankets for protection of hood and radiator against the cold

machine except for the equipment: big capacity tool boxes on the running boards, plenty of spare tires, gasoline and oil, a sleeping bag fastened on one side and a coil of rope hung on one of the lamp brackets. The officer was assisted by a motorcyclist, known to his companions as the hyphen, for his duties were to keep in touch with each unit of the convoy, explore the road ahead in case of danger, and report, stand by, and bring in any laggard.

Two Contrasting Truck Crews

There is a general impression, unfortunately too prevalent among army officers without technical knowledge, that any man who has had a few days instruction behind a steering wheel is fit for service on trucks. Thus, in many cases young men who are specially fitted for this class of work are being taken off the trucks to serve in the trenches and their places are taken by older reservists with little or no automobile experience. Skilled mechanics and professional chauffeurs who are serving in the ranks are treated as shirkers if they make application for a transfer to the automobile service. In giving way to the popular impression that automobile driving is a soft job which ought to be reserved for the old men unfit for service with the first line troops, the authorities appear to have made a mistake. We had a remarkable example of it in this convoy and one we met the following day. The Delahayes were in charge of an ex-aviator who knew as much as any officer need know about automobiles. His motorcyclist was a professional road racing cyclist acquainted with every highway in France. The man in charge of the repair truck was a professional tester who had seen service in French and American factories; several of the drivers were chassis testers; there was not a green man among them. As a consequence the men of the convoy were a self-satisfied family; they never missed a journey and nothing short of an enemy's shell would hold a truck back.

Theory Vs. Experience

The contrast was a convoy of twenty-three Aries trucks. The officer in charge had doubtless passed the theoretical examination in brilliant style, but his ordinary business was not connected with automobiles, and he had little practical experience. The next in rank was a sub-officer who handled a Paris taxicab in civil life and who counterbalanced his lack of technical knowledge by his severity towards the men. Most of the professional automobile drivers had been transferred to the active army and their places taken by painters, grocers, and others of small practical experience. The only man capable of taking up a connecting-rod bearing on the road was sore because of a threatened transfer to a line regiment. Although this convoy delivered the goods according to schedule, the number of trucks under repair was always larger than desirable.

Cooks Meals as Trucks Travel

Of the twenty-three trucks in this convoy twenty-two were 3-ton models and one a 5-tonner. This latter carried the same useful load as the others, and in addition took charge of the convoy's spare parts and spare equipment. It was useful, too, in taking charge of a broken-down truck, or pulling a bogged automobile out of the mud. The cook in the party had fitted up the rear of his truck to receive a big stew pan, the stovepipe of which projected through the rear and passed up above the canvas roof. He prepared meat and vegetables while on the road and was able to serve out soup and boiled beef as soon as the convoy had taken up its position on the street or market place selected for the night. In this way he was able to serve hot meals at regular hours irrespective of the movement of his section.

One of the most interesting sights was a convoy of fifteen all-drive tractors attached to an artillery regiment and employed in taking ammunition from the depot to the batteries

Army automobiles crossing the river Marne on a floating bridge

in the field. These were among the best equipped and the most efficient of the heavy motor brigade. Each tractor hauled two trailers with a couple of men on each for brake service. The personal interest which each man took in his tractor, the pride he had in maintaining it in the best running order and in keeping up to schedule was manifest in conversation with them. They displayed it, too, in adopting names for their vehicles, such titles as "Pourquoi Pas," "Quand Meme," "La France," etc., being painted on the bonnet of each truck. The ease with which these fifteen tractors, representing in all forty-five vehicles, negotiated narrow, winding roads, obeying the signals given to them by whistle, was really remarkable. They possessed the regularity of a train with all the mobility of individual automobiles.

The Aviation Supply Trucks

The flying corps figured prominently on that route to the front. New motors, landing chassis, spare propellers and other parts were taken out on 3-ton trucks with closed canvas body. On nearly every occasion a truck going to the front took in tow a complete but dismounted aeroplane on a two wheel carriage with a canvas cover on steel hoops. In addition to avoiding packing in a wood case, this method of transport is quicker than the train. A truck can leave the aeroplane factories around Paris in the morning and deliver the machine to the flying brigade 100 miles away the same evening. By train the same journey would average 48 hours.

Automobile Transportation Gains

It is evident that the allies are paying more and more attention to the question of the transportation of troops by automobile. In addition to the many American trucks used almost exclusively for carrying men, London has supplied hundreds of motorbuses for this work, many of the Paris buses are handling troops and new Paris bus chassis have been specially fitted up for this service. For service at the front the all-wood single deck body with which the Paris buses were fitted when in city service is not really necessary. Weight can be reduced by fitting a stake body with canvas hood mounted on steel hoops received in sockets. There is little difference in the comfort of a body of this type and the regulation all-wood type, while the advantages are lower weight and ability to transform the bus into a truck within an hour. Some of the London buses have had their upper deck removed, thus getting rid of a lot of weight. With the upper deck gone the passenger capacity is cut in half, but the vehicles become more useful for general service. The two decker is not an altogether satisfactory proposition near the firing line; it is too visible a mark, and occasionally it is found that the buses cannot pass under railroad bridges.

Eliminating the Gearset Problem

Lower Gears Do Not Operate Most Efficiently Except on Exact Grades for which Each Was Designed

WHAT is it that gives the average driver most trouble in driving? What is it that causes the novice most concern? What is it that keeps many women from learning to drive? What is it that makes most noise in a chassis? Emphatically the gearset.

When the automobile was a new thing it was really essential to understand it thoroughly before one could hope to drive it. Skill of a fairly high order was needed to control the motor, to shift the spark lever to and fro, constantly to adjust a throttle lever and an air lever, while gear shifting had to be done every few minutes, since the motors had no sort of flexibility whatever.

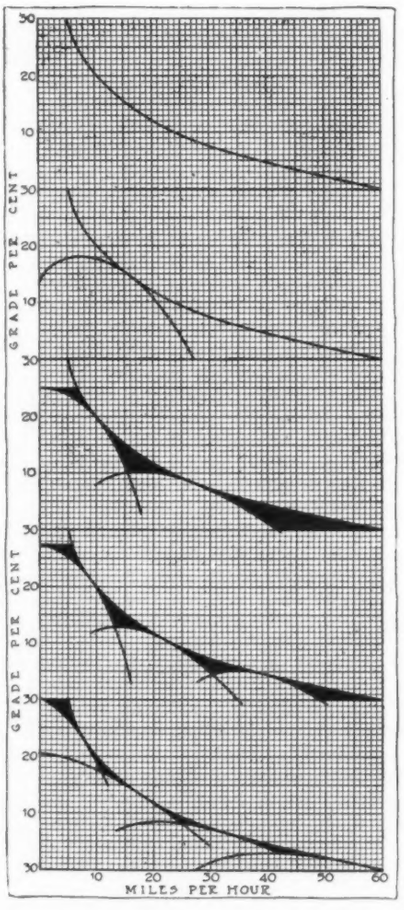
Gradually these things were eliminated and first of all the air lever vanished, or became a thing which needed to be touched only occasionally. Next the magneto made it unnecessary to shift the spark so often: automatic carbureters improved flexibility and the motor needed very little skill to make it work at its best. The difficulty of shifting gears was lessened by reason of motor improvement, and detail alterations in design caused the gears to mesh more easily, while the coming of the direct top speed did away with a deal of noise in the transmission.

Having found that improving the motor satisfied the driver, manufacturers have left the gearset practically alone and have thus encouraged the motorist to demand greater and greater top speed ability. Everyone dislikes dropping into a lower gear because of the trouble of changing the gears and because of the increased noise of the lower ratios. Big motors mean higher gasoline consumption, greater weight, shorter life of tires and greater first cost; it is only on rare occasions that the full power is used when running on level ground and less power on a lower gear ratio would give just as great a speed on grades as is to be obtained from the big motor running slowly on top gear.

The mechanical crudity of the sliding gear appalled engineers in the early days, and this led to the prolonged endeavor to popularize the epicyclic gear, which is still used on the Ford. But this gear is costly to make, except in the two-speed form, and it is complicated to an extreme degree if three or four speeds are demanded, while it is also not perfectly quiet.

Before considering the mechanical alternatives to the sliding gearset it will be well to examine the whole question of gear ratios and to do so properly it is best to come right back to first principles.

With a steam car power is obtained on grades by increasing the amount or the pressure of the steam admitted, and as the speed falls we can keep the power output the same by increasing the average steam pressure throughout the stroke. Thus we can figure on a constant power throughout a wide range of engine speeds and can calculate the car speed on any grade on the basis of constant power. With a gasoline motor we have to take the power curve of the motor as a basis, and this will give us a definite power for definite crankshaft speeds only. Knowing the gear ratios, we can calculate the grades that the car will climb and the speed of climbing for any one gear or, taking the grades required to be climbed on any particular gear, we can figure the necessary ratio.



Figs. 1 to 5 reading from top to bottom. 1 shows diagrammatically the effect on speed of car on rising grade if power available at road wheels was constant. 2 represents power at road wheels obtainable from gasoline motor on one gear which touches ideal curve at 15 miles an hour and 15 per cent grade. 3 shows range of car speeds obtainable with two gears, 4 range with three speeds and 5 with four gears. In last three diagrams the black part shows the periods where the actual performance differs from the ideal performance shown in 1

Effect of Gears on Speed

If the motor were to give constant power whatever the speed of the crankshaft and we take a piece of squared paper to plot the car speed in miles against the grade per cent. we should get a curve of the shape shown in Fig. 1. This curve would vary according to the weight of the car, the resistance of the air at differing speeds, and so on, but with the average car it would be of the characteristic shape shown. Now, with our gasoline motor that cannot give the same power over anything like so wide a range, we must introduce gearing so as to get the needed power by letting the crankshaft speed rise as the car speed falls.

If we had a gear with an infinite number of steps, like friction gearing, we should be able to get exactly the same power for each car speed within the limits set by the diagram, Fig. 1. But having a definite power curve for the motor and definite gear ratios separated fairly wide apart, there will be only one particular grade to which each gear ratio is suited exactly. If we take Fig. 1 and choose a gear ratio that will exactly suit a grade of 15 per cent. we can then determine the speed of the car as the grade increases or decreases while the gear ratio remains unchanged, and we shall find that the curve of actual performance varies from the ideal curve to an increasing extent as we go in either direction away from the point where the two curves touch. It is to be noticed that the curve of real performance lies always to the left of the ideal, which means that, if the gradient eases, the power increases more rapidly than need be—in other words, power is being thrown away and the car is not traveling as fast as it ought for the motor output. If we go the other way, and increase the grade,

the motor power falls off and the speed therefore falls off too, faster than it would if the motor output was constant. This means that with a three-speed gearset there are only three definite miles-per-hour road speeds at which the motor is exactly suited to the work it has to do.

Effect of Number of Gears

Figs. 3, 4 and 5 show the same ideal curve of constant power, and the effect of using two, three or four gear ratios: the black parts show the degree of difference between real and ideal. Thus we can see that the four-speed gearset gives a very close approximation to the ideal indeed; so close that if we tried five or six speeds the approximation would be improved only imperceptibly.

In Europe, where drivers have less objection to gear shifting than they have here, four speeds have become the rule, but motorists only accept the task of hand manipulation of the changing lever because they have been offered no substitute. They prefer the four-speed gearset to the three because it gives faster hill climbing and they are prepared to go to the trouble of using the gear lever in order to get the speed. As a consequence of this habitual use of the indirect ratios there is continuous complaint concerning the noise of the gears, and manufacturers are put to great expense in order to get the third speed, which is the most used, as quiet as skilled hand work on the gears can make it.

So far the only alternatives have been the small motor with a gearset that is meant to be used, and the big engine with a gearset intended only for emergency, that is if we except the two or three electric transmissions and hydraulic gears which have been subjects of experiment from time to time. Nothing is likely to be done that really counts until some of the big manufacturers take up the subject and give us a car that will automatically vary the gear to suit the road resistance; what has kept them from it is absence of a public demand. Let it be remembered, however, that there was no outcry for the electric starter till some of the large concerns had offered it, and that the originators of the starter reaped a fairly rich harvest. Imagine what would happen if one of our important firms were to bring out a model that eliminated the gear lever and changed the ratios without conscious separate effort on the driver's part.

Alternative Transmissions

So far the only promising scheme is the electrical transmission or the combined electric and mechanical system, for it is in these only that noise is eliminated from the lower gears, and it is well known that there is great difficulty in obtaining a good efficiency from an electric transmission without adding considerably to the weight of the chassis. It cannot be doubted, however, that this is a matter for research, and any determined effort to put the electrical transmission into form on a large scale practical would be bound to bring about its very great improvement. The diagrams showing how closely four speeds serve to fill the requirements of the case may be useful in drawing attention to the lack of need for a complicated switch gear control to give an almost infinite number of speeds, because it seems reasonable to suppose control would be simplified by using a small number of steps.

Extended Venturi in New Schebler

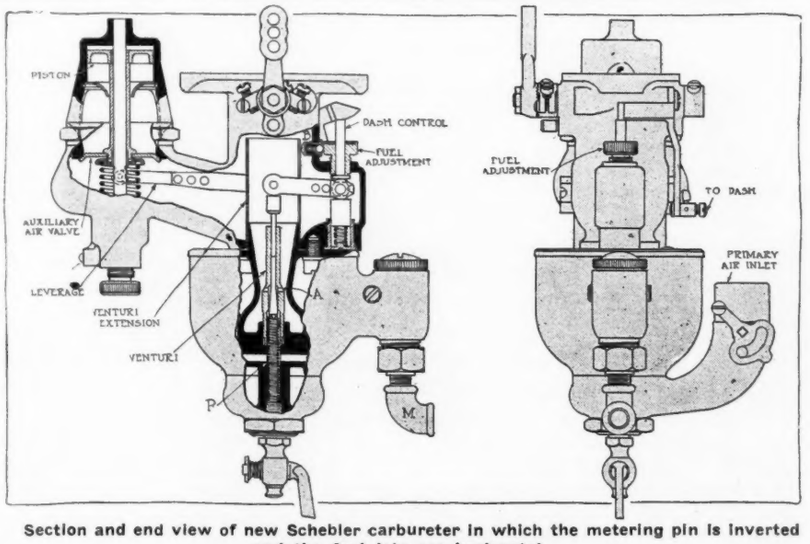
THE model R Schebler carbureter is to be superseded by a new design which, while following all the principles identified with Schebler practice, is none the less considerably different in detail. The new carbureter is shown in the accompanying illustration and it will be noticed that it is inverted, by comparison with the model R; that is to say, the metering pin or needle opens the jet by depression instead of by lifting, and the air valve opens downward instead of upward.

The long end of the leverage is connected to the air valve and the short arm to the needle, so that the latter travels a much less distance than the former. For setting the amount of fuel passed—the size of the jet oriffice—for running with the air valve closed, there is a screw which raises or lowers the fulcrum of the lever and there is also a dash control having the same effect by pushing down the fulcrum against a small spring. The long extension to the venturi, not hitherto a characteristic of Schebler construction, is present in a most pronounced form and the venturi is very narrow round the jet orifices, which are horizontal and shown at A in the drawing. Fuel enters through the union M and the spring P holds the metering pin upwards against the restraining action of the lever.

For setting the air valve there is an easily accessible knurled screw shown in the drawing, and fluttering is restrained by the piston dashpot located in the chamber above the valve. Primary air enters beneath the jet passage, and there is a little throttle in the intake to increase the depression for starting purposes. A feature that should prove useful is the little cock at the bottom of the jet passage, since this would enable the jet to be cleared of dirt without taking apart any portion of the carbureter under ordinary conditions of clogging by small particles.

Judging simply from the design it appears that the new Schebler should be easy to adjust and the greatly narrowed venturi ought to give facile starting; the horizontal arrangement of the jets ought to encourage proper atomization of the fuel and the long venturi should prevent any interference with the functioning of the jets which might otherwise be caused by the opening of the air valve.

The carbureter is adapted for the use of a hot-air flexible tubing to be operated in conjunction with a stove on the exhaust manifold, and it is recommended that such a fitting be applied. The lever which controls by a valve the supply of air through the primary air intake is so arranged that if desired it can be connected with a linkage to the dash.



Section and end view of new Schebler carbureter in which the metering pin is inverted and the fuel jets are horizontal

The Rostrum

Installing a Generator

EDITOR THE AUTOMOBILE:—Would you kindly tell me if a Willard storage battery could be installed in my 1913 Studebaker 25, and also a dynamo? If so, where could they be placed and how much would it cost?

Pembina, N. Dak. JACK CHISHOLM.

—Both a storage battery and a dynamo can be installed on your car. The installation of the storage battery can be made by yourself by simply arranging a cradle for the battery in a convenient position on a car and will cost you nothing beyond the price of a battery. A 60-ampere hour battery will be sufficient for all purposes and even a 40-ampere hour size will be large enough for your lighting system. The installation of the generator and position upon the motor in which it is placed will depend altogether on the make of the generator and the manner in which it is driven. If it is possible to make a simple belt or friction contact off the flywheel installation it will cost about $10.

Wants to Eliminate Piston Slap

Editor THE AUTOMOBILE:—I have a 1913 Model T Ford touring car and have run it about 15,000 miles. The pistons have some side slap which causes them to knock. I had some new rings put in but it did not remedy the difficulty. Do you think that by putting in a patent ring it would help any?

Plainville, Ill. A. D. ANDERSON.

—It is possible that you can buy oversized pistons for the Ford car which would help or as you suggest, some make of patent ring which would provide an extra amount of bearing surface and thus take up the side lash in the piston. The surest method is to have the cylinders rebored and new pistons and rings fitted, but if you do not desire to go to this trouble the slight expense of the piston ring renders it well worth trying.

Mitchell Transmissions Made in Racine

Editor THE AUTOMOBILE:—Please inform me who made the transmissions for the 1912 model Mitchell car.

Bridgeport, Conn. LAUREL GARAGE.

—These were made by the Mitchell Lewis Co., Racine, Wis.

Stevens X a 1911 Model

Editor THE AUTOMOBILE:—1—What year is the Stevens Duryea model X? Is it an early 1911 or a late 1910 model?

2—What is the bore and stroke?

Elmhurst, N. Y. GEO. W. GAY.

—1—The Stevens Duryea model X was put on the market for 1911 and is therefore a 1911 car.

2—The bore is 4.75 inches and the stroke 4.5. This is one of the few cars which has a stroke that is less than the bore.

Wants to Install Magneto Ignition

Editor THE AUTOMOBILE:—Will you kindly explain in the Rostrum a practical method of attaching a Bosch high-tension magneto to a Chalmers model 26 B. Could this be satisfactorily accomplished by leaving the present battery system as it is and installing a new set of spark plugs for the magneto, thus giving double ignition? It would seem in this type of T-head motor that considerable power and higher efficiency would be gained if the above can be accomplished.

Springfield, Mass. W. T. G.

—If you desire to go to the expense entailed it will be possible to put a Bosch magneto on this car. It is simply a question of machine work, as a bracket would have to be made and the magneto driven by bevel gears. The present battery system can be left in place and a new set of spark plugs installed, giving a double system, but it must be remembered that this will not be a two-point system with synchronized sparks.

The bracket is mounted on the side of the crankcase in the form of a shelf and the bevel drive can be taken off the shaft that is now utilized for the battery distributer.

Tight Rings Prevent Carbon Trouble

Editor THE AUTOMOBILE:—I am writing to inquire as to the advisability of installing in my National car, series VI roadster, a patent piston ring. This ring is made by a local concern and is designed to hold compression.

My motor is 4 7-8 by 6 and I have been told that the compression will be so high that it will tend to loosen the bearings. The ring manufacturer claims that it will increase the compression 10 pounds to each cylinder. Will this give me more power on the hills? The car is geared 2 1-2 to 1 and I have difficulty in climbing hills on high gear.

2—Should not this ring do away with carbon trouble?

Albany, N. Y. JAMES B. LYON, JR.

—The use of a patent ring to hold compression is a good idea where the ring is of such a kind that it tightly seals the cylinder without adding an undue amount to the friction. You need have no worry about the compression being made so high as to loosen your bearings, as when the motor was new there is no doubt the rings that you have in the motor did not leak. A piston ring cannot increase compression where there has been no leakage beforehand. It can only hold compression by preventing leakage. If you have no leaks in your present rings, no ring that you could add will increase the compression. The compression is determined by the ratio of the piston displacement to the compression space.

If your present rings are leaky, the addition of rings which do not leak will give you more power on hills. If the car is geared 2.5 to 1 it is natural to expect that very hilly country will trouble you on high gear as this is a small reduction.

2—If you have carbon trouble due to the leakage of lubricating oil past the rings the use of tight rings will prevent this trouble.

Differential Adjustment on Hupmobile

Editor THE AUTOMOBILE:—Kindly advise me if the Hupmobile company ever made a car that has no adjustment for differential pinion and bevel gear.

Philadelphia, Pa. J. B. G.

—All Hupmobiles have been made with an adjustment between the bevel drive pinion and the bevel gear. However, on the Hupmobile 20 this adjustment was accomplished by the use of shims or washers placed behind the differential bearings. Several of these shims were also provided between the housing which carries the drive pinion and the bevel gear housing. On the model 32, and the model K cars, this adjustment is made by threaded differential and drive pinion carriers and of course on these later cars the adjustment is much simpler, since the gears can be lined up properly without removing any part.

Believes in Use of External Treads

Editor THE AUTOMOBILE:—I have recently seen an article in some magazine telling how to keep extra or spare tires soft; or, how to prevent them from becoming hard and brittle from non-use. If a car is equipped with demountable rims,

it strikes me that a better way would be to change one wheel weekly, thereby giving each tire four weeks' continual use and 1 week rest. By going around the car the first week, right rear; second week, right front; third week, left front and fourth week, left rear, it would also give each tire a change of position, from right to left, and from driving to steering, thereby equalizing the wear.

The makers of patent treads claim that four sets of treads will give four times the life to the rubber shoes. Their cost is about two-thirds that of rubber shoes. That would seem to make them economical, but I doubt if there is any saving in that way. The extra weight on the periphery of each wheel takes more power. I kept careful tabs on a Ford, and estimate that it took about 20 per cent. more gasoline to drive the car with, than without them.

They are not as resilient as bare shoes. Hob nail leather boots are stiffer than rubber, so that I go more slowly over pavements, or rough places. Abrasions, to say nothing of punctures, are just as apt to occur within one rod of the garage door, as in any other single rod of a 1,000-mile trip. Consequently, it behooves all to critaclly examine their shoes every time the car goes out. It may be running all right, but little stones imbedded in the rubber will fester, like a splinter in the hand, unless removed and salve applied. About the only things that need watching on the patent treads are the springs that hold them in place. When one is found broken, it should be replaced at an early convenience. A puncture or blow-out needs heroic treatment on the spot; but a broken spring on those treads can wait for a leisure hour, though the sooner it is replaced the better. Any material damage would show without microscopical inspection; at the same time it is well to go over them occasionally to make sure that some tack, or nail, has not become imbedded. The treads are not warranted puncture proof. It is merely claimed that they materially reduce the chances.

In nearly 2 years' use, no punctures, no skidding, no tire troubles or anxieties, no extra tires to lug around and care for, are worth a great deal, which cannot be computed in dollars.

Boston, Mass. W. G. R.

To Install Stewart Vacuum System

Editor THE AUTOMOBILE:—I have a Reo 1914 model to which I have been thinking of attaching a Stewart vacuum system.

1—Will it reduce the gas consumption?

2—If so, about what will the increase in mileage be per gallon of gas?

3—If you think advisable, give diagram showing how to install same

Jamestown, Mo. F. A. HEYSSEL.

—1—Since the Reo car 1914 model was equipped with gravity feed, the installation of the vacuum feed will not reduce the gasoline consumption because the final feed to the carbureter on this system as well as that you employ is by gravity.

2—This is answered under question 1.

3—Inasmuch as you are considering vacuum feed it must be that the gravity feed you are employing does not give you good results when ascending fairly steep grades. Under these circumstances the Stewart vacuum tank should be located on the engine side of the dash under the hood as high as possible.

The method of connection of this system is as follows: Three points must be borne in mind on making the tank installation.

A—The top of the Stewart Vacuum tank must be above the level of the gasoline in the main supply reservoir when full, even when the car is descending steep grades.

B—The bottom of the Stewart Vacuum tank must be not less than 3 inches above the carbureter.

C—The tank should not be installed near the exhaust of the motor, nor directly over any wiring or electrical instruments that could be harmed by a possible leakage of gasoline.

Supplied with the Stewart system when you purchase it, there will be the vacuum gasoline tank complete, Fig. 1; a coil of 8 feet of 5-16-inch brass tubing; a Lavigne ball solderless coupling, three Lavigne ball solderless elbows and four straps and screws for holding the tubing in place. The coil of brass tubing is sufficient to cut up into lengths to supply the vacuum connection between the tank and the intake manifold, the connection from the bottom of the tank to the carbureter and the gasoline connection from the top of the vacuum tank to the point where it must be connected with the old pipe from the gasoline storage tank. Beyond this point you can secure detailed directions from the instructions furnished with the vacuum feed system.

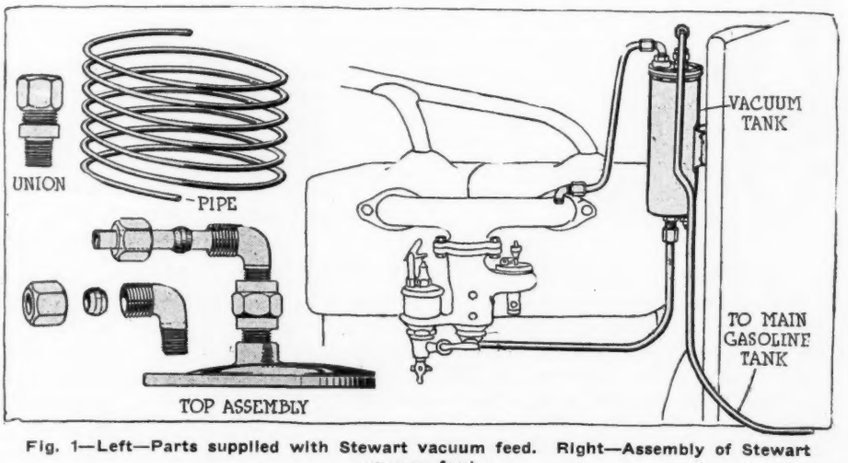


Fig. 1—Left—Parts supplied with Stewart vacuum feed. Right—Assembly of Stewart vacuum feed

Dry Cells on Starting Ignition

Editor THE AUTOMOBILE:—Is it possible to use the storage cells on a 1913 Abbott-Detroit 34-40 for starting ignition purposes ? As it is now, three dry cells in series are used and after the motor is turning under its own power, a magneto is used for ignition.

Lincoln, Neb. C. J. F.

—The Abbott 34-40 is equipped with a storage battery which is used in connection with the cranking motor to turn the engine over. Dry cells are used as means of ignition for starting the car and, although a number of Abbott owners are using the storage battery as a means of ignition with very satisfactory results, this practice is not recommended for the reason that the spark derived from the storage has a tendency to burn out the points on the coil.

Automobile Engine in Motor Boat

Editor THE AUTOMOBILE:—Will an automobile engine give the same service as a marine engine in a motor boat?

2—What difference is there in their construction, if any?

I have been told by some parties that automobile engines would not give satisfaction in motor boat work. Others have told me that the fastest motor boat they ever saw had the engine from a Ford car. I am thinking of using a Ford or Flanders automobile engine in a 30-foot launch. If you can give me advice on the above matter and tell me the speed of crankshaft on a Ford motor when the automobile is making

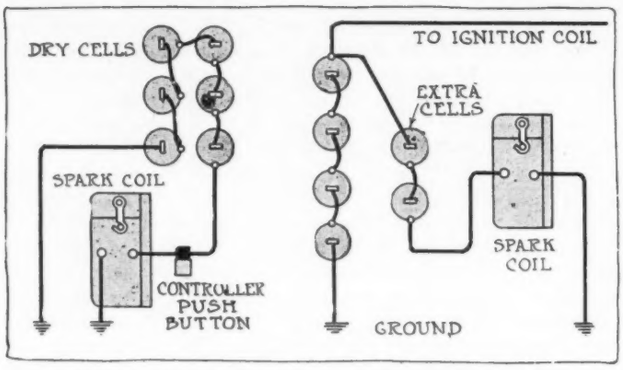


Fig. 2—Wiring diagrams of primary circuits with six and four ignition cells for lighting device for acetylene lamps

about 20 miles per hour, I would greatly appreciate it. Probably some of your subscribers have tried the above and can give me some valuable information.

Walnut Ridge, Ark. W. J. CHAMBERLAIN.

—The only motor boat which can properly use an automobile engine is one of a very high-speed type. The light racing boat can use the same engine as is employed in an automobile with good results. The reason for this is altogether a question of propeller design. It would not be correct to use a light, high-speed motor with a propeller designed for this purpose in a heavy-duty boat as the efficiency would be very poor.

2—The difference in the construction is altogether in the expressions, high speed and heavy duty. The light high-speed engine is designed to run at a higher r.p.m. with a great reduction and the heavy duty engine is supposed to run at a low speed with small reduction.

When the Ford car is making 20 miles per hour the rear wheels, being 30 inches in diameter, are turning 224.1 times per minute. With a gear ratio of 3.6 to 1 the motor would be turning over 806 r.p.m.

Loose Set Screw Causes Knock

Editor THE AUTOMOBILE:—I noticed in The Rostrum of THE AUTOMOBILE that one of your subscribers had a knock in the motor. I may say that I had the same trouble and took the motor down three times before I found it. Each time I tightened up the set screws that hold the wristpin but the knock would soon come back. The last time I found that the trouble was not with the wristpin but that the bushing in the upper end of connecting-rod had become loose, allowing about 1-32-inch play every time the motor made a revolution. This amount of play together with the stress put on the connecting-rod at each turn caused the lower bearing to wear and loosen so that each time the knock became so bad that it was unbearable and I was compelled to take the motor down, when I found the set that holds the wristpin screws loose also, while all the time the trouble took its origin in the loose bushing. When I asked several motorists about this knock when I first heard it they all told me to leave it alone. But my lesson from experience is to stop a knock as soon as possible for my nerves' sake if nothing else.

Wachapreague, Pa. A SUBSCRIBER.

Horsepower Formulas Give Different Sizes

Editor THE AUTOMOBILE:—Referring to THE AUTOMOBILE for January 21, 1915, in which appears an article showing the horsepower formulas for gasoline engines used in various countries for purposes of taxation, it is noted that the horsepower for the same engine when calculated by the various formulas varies between wide limits. I should very much like to know whether this is due to the fact that these formulas give the horsepower for purposes of taxation only, or whether there is any effort made to indicate the actual horsepower. It does not appear at all possible that cars of foreign make could develop a horsepower so much greater than those of American manufacture.

Washington, D. C. J. B. ROSE.

—The mere fact that the actual b.h.p. of motors of the same size varies within such wide limits would be sufficient to indicate that the horsepower formulæ which are calculated to approximate the b.h.p. outputs should themselves vary. As a matter of fact, however, our foreign contemporaries are securing a slightly higher b.h.p. per unit of piston displacement than we are in America. This is due to the use of longer stroke motors running at higher rotative speeds.

Cleaning Slip Covers for Seats

Editor THE AUTOMOBILE:—What is the proper way to clean top slip covers?

2—Is it necessary to remove them?

Newark, N. J. W. F. S.

—To take the dust out, the vacuum cleaner is probably better than any other method, although a vigorous brushing will probably suffice if the vacuum cleaner is not available. To take spots out, the proper solution to use will depend on the nature of the spots as different stains or materials that cause stains are soluble in different liquids. For all ordinary purposes, warm water and castile soap will do the work very well.

2—To do a thorough job, it is better to remove the covers, although for slightly stained goods this will not be necessary.

Explains Theory of Thermo-Syphon

Editor THE AUTOMOBILE:—Regarding the article on The Use of Thermo-Syphon Cooling on page 325 of THE AUTOMOBILE for February 18, your answer is not complete. Primarily the thermo-syphon is used in cooling because in winter time you secure no flow of water until heat from the cylinders has affected the water. Therefore, the maximum speed of water circulation is not obtained until the correct temperature of the cylinder is attained. In summer a radiator is not necessary if you have enough capacity for carrying water. That is why radiators on thermo-syphon cars invariably carry more water than is carried by the cars using a water pump.

The aim of manufacturers to maintain a temperature most suitable to the efficiency of the engine is illustrated in the Cadillac with thermostatic control of water circulation and the Glide, with an abnormally large radiator, giving more cooling surface in summer and a more tardy circulation in winter.

Chicago, Ill. A. LEE HENSON.

A. L. A. M. and S. A. E. Formula the Same

Editor THE AUTOMOBILE:—Kindly give me the A. L. A. M formula for horsepower in gas engines. Also the S. A. E. formula.

Philadelphia, Pa. JOSEPH H. BROMLEY, JR.

—The two names you mention are for the same formula. When the A. L. A. M. organization went out of existence the name of the formula was changed by many to Society of Automobile Engineers, or S. A. E. The formula is $\frac{D^2N}{2.5}$ where D is the diameter of the cylinder or bore and N the number of cylinders.

Misses Fire at Low Speeds

Editor THE AUTOMOBILE:—I have a model 19 Buick that will not run slow enough on high. How can this be helped?

2—Will lowering the compression by putting plates under the cylinders help? If so, how thick should they be?

Clay Center, Kan. G. L.

—The probabilities are that the ignition is weak at low speed. Try putting the spark plug points closer together and if this does not work out go over the ignition system thoroughly for possible leaks or losses of current.

2—It is not advisable to lower this compression.

Oversize Tires Often Most Economical

Editor THE AUTOMOBILE:—1—The writer is contemplating buying a six-cylinder car which carries a regular 34 by 4 tire. He has been informed by many that by using oversized tires or a size 35 by 4 1-2, that he would get a great deal easier riding and the life of the tire would be much longer. The difference in the price of a 34 by 4 and a 35 by 4 1-2 is in the neighborhood of 1-3 more. Can you please advise, if consistent, what your views are in regard to this?

2—This car is equipped with cantilever springs. What is your opinion on this type of spring?

St. Louis, Mo. J. S. CARADINE.

—Oversized tires are generally more economical than the ordinary size when the load in the car is greater than the designed load, when the roads are harder on tires and when the speeds are higher than normal. If your car is lightly loaded and you are running at low and medium speeds there will be no advantage in using the oversize as the tires will perish by cutting before they will become worn out.

2—Cantilever springs give a very satisfactory and easy suspension.

Guides Pressed Into Overland Cylinder

Editor THE AUTOMOBILE:—1—Kindly tell me in your magazine the best method to remove the valve stem guides of a model 59 Overland and to replace them with new ones.

2—In the same model, will the camshaft have to be removed to put in new push rod guides?

Lostant, Ill. X. Y. Z.

—In this model the cylinder valve stem guides are pressed into the cylinders under considerable pressure and great difficulty is generally experienced in removing these guards, as they are made of gray iron and are very brittle. Consequently, they are generally broken when they are being driven from the cylinders.

It is very seldom found necessary to install new valve stem guides as the stems of the valves generally wear instead of the guides and consequently any play is taken up when new valves are fitted.

2—In order to install this particular part of the motor on model 59 it is necessary to remove the camshaft as the push rod guides are installed from the inside of the crankshaft.

Liquid Spills from Storage Battery

Editor THE AUTOMOBILE:—I have a model 3 Buick runabout with a Vesta magneto generator and Vesta storage batteries 6-80. The other box rotted so that I had to tear it off; also the tar-like composition covering the three cells. What is this composition and where could I get something new to replace it with as I intend to make a new outer box? Or, would a regular battery box of right size be better to set batteries in, providing the composition was tight around between it and the cells? It seems as though the metal box would not rot away like the wooden one has.

2—Could a starter be put on this car geared to the magneto and pumpshaft, if the starter were a single unit type? If not, what system could be used, and at what expense about could it be installed?

3—Could I use the new tungsten valves in this model?

Phillipburg, N. J. G. H. ZINK.

—The fact that the battery is leaky is sufficient to show that it should be entirely reboxed and a new jar put in. This you should have done by the Vesta Company, the makers of the battery itself. The charge for this is $4.25 but should any of the plates need repairing this will of course be extra. You cannot hope to put a leaky battery into any container, and have that container last, as the acid will destroy anything with which it comes in contact. The most durable substance for resisting its inroads is lead but it would not be worth while for you to go to the expense of securing a lead-lined container when you can have the cause of the trouble removed by having the battery reboxed and a new jar fitted as specified.

2—A single-system of electric starting and lighting can be installed on this car. There are several makes which would be available for the purpose and the expense would, of course, vary with each.

3—You can use the tungsten valves if you desire.

Electric Connections for Gas Lamps

Editor THE AUTOMOBILE:—I saw a diagram a few weeks ago, showing how to wire a car so the gas lamps can be lighted by a jump spark. I have a 1911 Regal car which has a Michigan magneto and a Michigan coil. How can I wire to this coil so that I can get the jump spark by pressing the coil button?

I noted that in your article you stated the regular coil on the car could be used for that purpose.

Springfield, O. GEO. R. BORDEN.

—The method employed in wiring a gas lamp so that it can be ignited by electricity is illustrated in Figs. 2 and 3. The connections shown in Fig. 2 are those used on the primary circuits. In one diagram will be noticed the connection with six dry cells and in the other with two batteries attached to the four cells used in the ignition circuit. The one which fits your case can be used.

Fig. 3 shows the connection of the secondary circuits and these connections will apply regardless of the type coil employed as the wiring diagram shows merely the principles of the connection. The diagrams as furnished are those provided by the Prest-O-Lite company in connection with their electric lighter.

As a general rule it can be remembered that all that it is necessary to do is to borrow a spark from the ignition circuit for use in igniting the gas at the jet of the lamps.

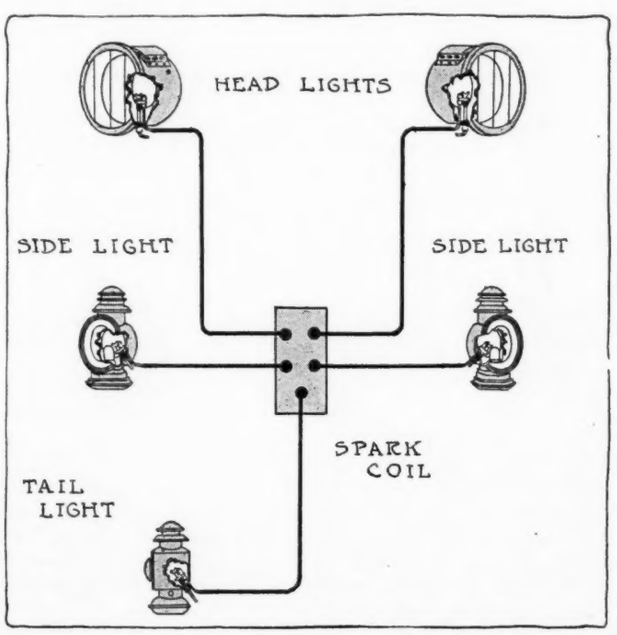


Fig. 3—Wiring diagram of the secondary circuits as used in the Prest-O-Liter device for lighting gas-lamps

Exhaust Heat Cuts Oil Film*

Lubrication Is Least Efficient on Scavenging Stroke—Viscosity of Oil Has Greatest Influence on Friction

By Lieutenant G. S. Bryan
Naval Engineering Experiment Station, Annapolis, Md.

IF an internal-combustion engine, using a certain brand of lubricating oil, runs indefinitely without giving trouble of any kind, we can feel certain of two things; first, that it is a well designed engine, and second, that it is using a good lubricating oil. Otherwise, trouble would occur.

If trouble does occur in an engine, however, we are confronted with several possibilities:

1—The engine and lubrication system may be poorly designed. 2—The oil may be poorly refined. 3—The oil may not be supplied to the cylinders in the right amount. 4—The oil may be of good quality, but may not be suited to that particular engine.

Trouble due to the first case is exceptional. That due to the second case is more frequent, perhaps, but is also exceptional among well known brands of oil. That under the third case depends sometimes on the design of the engine, but more often on the lack of care exercised in maintaining the proper oil level in the crankcase. The remedy for both of these faults is obvious. Trouble encountered under this head may well depend, however, on the fourth case, in that it is necessary to use an oil that is suitable as well as of good quality, or the correct amount will not be supplied the cylinders.

We can assume that most of the engines on the market are correctly designed. From the fact that most of the different varieties of oils on the market work satisfactorily in some engines, we can also safely assume that they are good oils when properly used in the right place. A consideration of the properties of cylinder oils, and an analysis of the conditions under which they lubricate, lead us to the belief that a large majority of the complaints about cylinder oils can be accounted for as due to ignorance regarding the principles governing their use.

Most gasoline motors have their cylinders lubricated by the splash system, the bearings being sometimes lubricated by force feed. In some cases the cylinders are also lubricated by force feed, the oil being injected through small holes in the side of the cylinder that are continually covered by the piston. The general principles governing cylinder lubrication, however, apply to both systems.

Reserve Oil in Crankcase

In the splash system on four-cycle motors the reserve oil is contained in the crankcase and each cylinder is lubricated by the splash of its own crank. A small dipper on the end of the connecting-rod dips into a trough of oil when the crank is at its lowest point, and with the upward stroke of the crank throws the adhering oil violently against the cylinder walls, splashing it in every direction. This oil is then spread evenly on the cylinder walls by the piston as it slides up and down. Every up-stroke of the crank thus gives a new supply of oil, and every up-stroke of the piston smears some of this oil on the upper part of the cylinder where the combustion takes place.

The operation in a four-cycle motor then is as follows:

Suction Stroke.—On the previous up-stroke of the piston oil was spread on the cylinder walls, and this furnishes lubrication as the piston descends on the suction stroke. At the bottom of the stroke the dipper dips into the oil.

Compression Stroke.—The film that has just lubricated the piston on the suction stroke will not be affected by the cool gases entering from the carbureter, and will be left intact to lubricate on the compression stroke. As the piston goes upward it smears a fresh film on the walls. A new supply of oil is also splashed on the lower part of the cylinder by the upward throw of the crank.

Explosion stroke.—The film smeared on the walls on the compression stroke is also sufficient to lubricate the piston on the down stroke. The combustion space on this stroke is exposed to a very high temperature, but the flame only comes into contact with the oil film after the latter has performed its allotted function of lubricating the piston; therefore no difficulty should be encountered. At the bottom of the stroke the dipper again dips into the oil.

Exhaust stroke.—This is the part of the cycle where the most difficulty is encountered with the lubrication. The oil film on the upper part of the cylinder walls has just been exposed to the very high temperature of the ignited gases, and has certainly been damaged to some extent. It still possesses some lubricating value, however, and also the piston itself is now covered with a film which it is about to smear on the walls as it moves upward. The combination of these two factors should be sufficient for the lubrication of this stroke. If trouble is encountered due to faulty lubrication, however, it will show principally on this stroke.

In the two-cycle type conditions are more severe. The oil film is here exposed to the temperature of the explosion every revolution instead of every other revolution as in the four-cycle type. To offset this, however, we have a lower compression and generally slower piston speed. When this is taken into consideration the problem does not appear to be so difficult, and experience has shown that this type can be lubricated efficiently without any particular difficulty.

The three essential requirements of a good motor cylinder oil are: 1—It must lubricate the piston efficiently at the temperatures encountered in the cylinder. 2—It must give a good seal to the piston and rings, keeping them tight and preventing leakage of the oil and condensed gasoline past them. 3—It must burn without forming carbon deposits in the cylinder when an excess of the oil gets into the combustion space.

The first requirement is a general one. If we examine closely into the action of the film of oil we shall see that it is subjected to widely different conditions at different depths. The lubricating value of an oil is due to the fact that when the surfaces of the cylinder and piston are separated by a film of oil the friction of these two metal surfaces is eliminated, and the friction that remains is only that occasioned by the sliding action of the molecules of oil past each other. In other words, it is the same as if

*A paper published in the Journal of the American Society of Naval Engineers for February, 1915.

two layers of oil are sliding past each other, and the friction that occurs takes place inside the oil film and not on the surface between the film and the metal. In other words we have a dual film—oil working against oil.

Viscosity Measures Friction

The quality of an oil that gives the comparative measure of the friction generated is the viscosity, and this may be defined as its resistance to flow. By oil manufacturers it is generally expressed numerically compared to that of water taken as unity; but as known by the consumer it is only expressed roughly as light, medium, heavy, etc., terms that are more generally understood. The higher the viscosity the less fluid the oil, and the greater the corresponding liquid friction. The viscosity of an oil decreases greatly with an increase of temperature, and at the working temperature in the cylinders even the heavy motor oils have their viscosities reduced to about that of a turbine oil at its working temperature.

Figure 1 will show this graphically. Oils A, B and C represent the heavy, medium and light grades of a well-known brand of Pennsylvania (paraffin base) oil. Oil D represents a heavy* oil of asphalt base. It will be noted that the falling off in viscosity with increased temperature is much greater in the case of the heavier grades. Also the viscosities of the Pennsylvania oils are maintained slightly better with increased temperatures.

The deciding factor with regard to viscosity is the condition of the piston and rings. If these are tight, a light oil will give good results. If they are badly worn and loose, a heavy oil becomes necessary. If the oil is too light, too much of it will be drawn past the piston rings on the suction stroke. Likewise on the compression stroke some of the gaseous mixture from the carbureter will leak past the piston rings and condense in the crankcase. As the gasoline which condenses in this way will tend to make the oil still lighter, this effect will be cumulative. Under the conditions of high rubbing speed and small piston-ring pressure that are generally found in motor cylinders, light oils, such as are used in turbines, would probably give the most efficient results if it were not for the high temperatures encountered in the cylinders.

Before discussing the effect of these high temperatures, it will be well to determine just what they are. Recent experiments abroad have shown that the maximum temperature attained in an internal-combustion engine is about 2,700 degrees F. This is the maximum and is obtained only at the top of the explosion stroke. The temperature is successively lowered as the gases expand on the explosion and exhaust strokes, and as the cool carbureter mixture enters the cylinder on the suction stroke. With the compression stroke the temperature begins to rise gradually until ignition takes place and causes it to jump up to 2,700 degrees again at the top of the stroke.

A recording thermometer used in the above investigation showed that the maximum temperature was about 2,700 degrees F., the minimum about 250 degrees F., and the average during a complete cycle about 950 degrees F. These temperatures are those of gases in the cylinders, and are not those of the cylinder walls. There is a great difference between the temperatures of these two.

An elaborate investigation was carried out by the Bureau of Mines in 1912† on the transmission of heat in steam boilers, and the successive drops in temperature due to the different media were determined. With the hot moving gases in the boiler at an average temperature of 1,550 degrees F., and the maximum of 2,700 degrees F., and the water in the boiler at 350 degrees F., the following results were obtained:

	Temperature drop, in degrees F.	Percentage of total drop.
Drop in temperature between moving gases and dry surface	1,047	87.3
Drop due to layer of soot on tube	65	5.4
Drop due to thickness of metal	13	1.1
Drop due to layer of scale on water side of tube	65	5.4
Drop between scale and water	10	0.8
Total	1,200	100.0

In an internal-combustion-engine cylinder the conditions are almost identical except that the temperatures are lower, and there is very little scale on the water side of the cylinder. There is no layer of soot if the cylinder is in good condition, but there is a film of oil on the cylinder walls which would have about the same effect. The point which it is desired to emphasize is the great difference in temperature between the moving gases in the cylinder and the cylinder walls, since this has a very important bearing on the lubrication.

Let us assume that the cooling water in the jacket is at a high temperature—say 200 degrees F., just below the boiling point. Using the average temperature found for the moving gases in a complete cycle (950 degrees F.), this gives us a total difference in temperature between these gases and the cooling water of 750 degrees. If we apportion this drop in the same way as for a steam boiler we have:

	Percentage of total drop.	Temperature drop, in degrees F.
Between moving gases and dry surface	87.2	654
Drop due to film of oil, assuming it to be the same as for layer of soot	5.4	40
		694

which would give us the temperature of the inner surface of the cylinder walls as $950 - 694 = 256$ degrees F.

Perhaps a more convenient way would be to figure this from the other end, that is, to determine the difference in temperature between the inner surface of the cylindr wall and the circulating water in the jacket. Under the same assumptions as above, this would be 7.4 per cent. of the total drop, which would give a difference of 56 degrees F. If we take the temperature of the circulating water as 150 degrees F., we get a difference of 58 degrees, so we can assume that the temperature of the cylinder walls is about 55 to 60* degrees higher than that of the circulating water. As long as the water is not boiling we know that the temperature of the walls is little, if any, higher than 267 degrees F.

In air-cooled motors the temperature would be somewhat

*The viscosities of the light, medium and heavy grades vary with the different brands. Two medium oils, of different brands, for instance, may differ greatly in viscosity.

†Bulletin No. 18, of the Bureau of Mines, 1912, "The Transmission of Heat into Steam Boilers."

*Since this was written some actual experiments conducted have given values of only 30 degrees. See "Steam as a By-product of Internal-combustion Engines," by J. B. Merriam, "Practical Engineer," November 15, 1914.

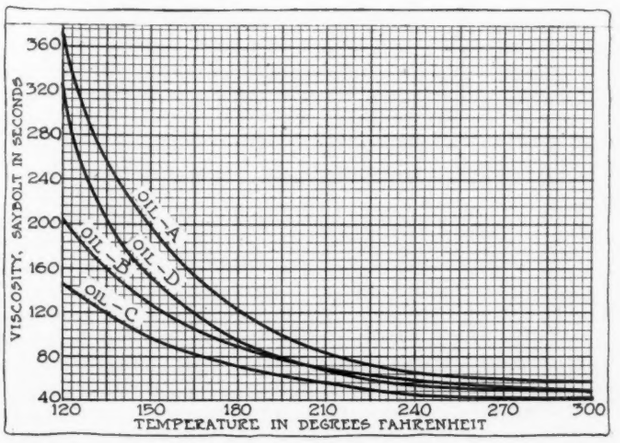


Fig. 1—Oils A, B and C represent the heavy, medium and light grades of a well-known Pennsylvania petroleum base oil. Oil D is a heavy asphalt base production

higher due to the less efficient method of cooling the cylinders. This does not mean that it would become too high, however, as it has been repeatedly demonstrated that properly designed air-cooled motors do not heat up excessively. The lubrication of this type of motors is more difficult at any rate.

With Diesel engines the maximum temperature is lower than in ordinary gasoline motors. Since ignition is by temperature of compression, the heating effect begins on the compression stroke; and since combustion is at constant pressure, the resulting average temperature in a cycle will be slightly higher. As long as these motors are water cooled, however, the temperature cannot exceed 267 degrees F. without the water boiling.

Difference in Film Temperature

It was mentioned previously that there was a vast difference between the temperature of the hot gases and the cylinder walls. It naturally follows that the inner and outer surfaces of the oil film will be exposed to quite different conditions. The inner surface is exposed to the high temperature of combustion, and without doubt is very greatly damaged thereby. The outer surface is exposed only to the comparatively low temperature of the cylinder walls, and with a film of any appreciable thickness would be protected from the heat due to low conductivity of this film.

We can consider the film as consisting of two layers, the function of one of these being to furnish the lubrication, and of the other being to withstand the destructive action of heat and to protect this lubricating layer. It is well known that an exceedingly thin layer will furnish lubrication, and it is probable that the greater part of the thickness of the film is used up in giving the requisite protective action from the heat. At any rate, the part that we must look to for lubrication is that part having the lowest temperature, which is the very thin layer next to the cylinder walls.

The action of heat on oils is indicated by two properties, the flash point and the fire point. The flash point of an oil is the temperature to which it must be heated in order that the vapors given off will give a slight explosion when a small flame is held immediately over the oil. The fire point is the temperature to which the oil must be heated in order that it will take fire and continue burning when a flame is applied. Roughly, it is about 50 degrees higher than the flash point.

It is important that the flash point shall be higher than the temperature of the inner surface of the cylinder, otherwise the vapor given off by the oil will prevent it from adhering to the walls. We have seen that with the water boiling in the jackets the temperature of the inner surface of the cylinder walls will be about 267 degrees F. The temperature of the layer of oil that is in immediate contact with the cylinder walls, which is the part that regulates the friction, cannot be much higher than this. I do not know of any motor oils that have a flash point lower than 325 degrees F. If the temperature of the cylinder walls gets up as high as this in a water-cooled motor there is something radically wrong, and the remedy is not to get another oil of higher flash point, but to locate the trouble and remove it.

It is an old theory that was never founded on solid facts that a high flash point is a necessity in a motor oil or the oil will burn up without giving any lubrication. The point was overlooked that, when we have a maximum temperature of the gases in the cylinder of 2,700 degrees F. and an average temperature of 950 degrees F., an oil with a flash point of 450 degrees F. will offer but little more resistance to burning than one would of 350 degrees F.

Either oil will burn if kept for any length of time in contact with the hot gas. Lubricating oil does not burn very easily or very fast, however, and the time given for it to burn in a motor cylinder is very short. A thin film of oil smeared on a hot (300 degrees) piece of iron or steel will burn for several seconds if ignited. Few motors ever run at less than 120 revolutions per minute, and at this rate the average point of lubricated surface on the cylinder wall would be exposed to the action of the flame for only one quarter of a second. It is easily seen that there is no danger of all the oil film being burned in that short time, though there is no doubt that some of it is burned, whether the flash point is 300 F. or 500 degrees F. At high speeds the time allowed the oil to burn is so small a fraction of a second that we need not worry at all on this score. It would therefore appear that a flash point of 300 degrees F. would be sufficiently high for almost any water-cooled motor. Air-cooled motors might in some cases require a higher flash point, but 300 degrees F. should be sufficiently high for Diesel engines except in unusual cases.

Silica Found in Carbon

The third requirement brings up the question of carbon in the cylinders. So much misinformation has been published on this subject that it will be well to look into the conditions resulting in its formation. In the first place, what is ordinarily known as carbon in the cylinders nearly always contains something else in greater or less quantity. Rust and small particles of iron are nearly always found. In automobile motors a large percentage of dust (silica) is generally present, and in marine motors and Diesel engines salt is a common constituent. In a case recently investigated at the Naval Engineering Experiment Station of an oil that was considered unsatisfactory on account of the large amount of carbon formed, a chemical analysis of the oil from the crankcase that was supposedly full of carbon gave results about as follows:

	Per Cent.		Per Cent.
Free oil	15	Decomposed oil	2
Water	12	Carbon	1
Rust	11	Foreign matter	1
Salt from sea water	58		

Carbon may exist in a motor oil in two forms: First, as free carbon held in suspension, and, second, in combination with hydrogen forming the numerous hydrocarbon compounds which go to make up the oil. The amount of free carbon in a well-refined oil is very small, and the objectionable carbon deposit is generally due to some other factor.

The conditions attained in the cylinders of internal-combustion engines that result in the formation of carbon are: First, high temperature, and, second, a limited supply of oxygen (air). References have been previously made in this article to the oil "burning." This term has been used rather loosely, as, strictly speaking, "burning" means the combining of the vapors from the oil with the oxygen of the air, and does not include simple vaporization of the oil. Unless air is present in excess of that required for the combustion of the gasoline or fuel oil, and usually it is not, the oil cannot really burn. Under the intense heat, however, the inner surface of the oil film will be vigorously affected, and, in the absence of the air necessary for burning, three things may happen:

Case 1. The compounds may volatilize without decomposition.

Case 2. The compounds may decompose with the formation of free carbon and hydrogen.

Case 3. The compounds may decompose with the formation of other hydrocarbon compounds of a different nature.

The products formed in case 1 give no trouble, as, being gaseous, they are carried out with the exhaust, whether burned or not. Of the products formed under case 2, the hydrogen would pass out of the exhaust, whether burned or not. The carbon may be blown out with the gases, or may remain in the cylinder. Whether or not it remained in the cylinder would depend greatly on the condition of the oil film on the cylinder walls. Some oils form a thick, viscous, gummy, asphalt-like deposit, which retains the carbon formed on its surface and prevents it from being blown out through

the exhaust. This gummy deposit gradually gets thicker and harder, eventually forming the hard carbon deposit so well known in cylinders.

This gummy deposit is due to the action of the compounds mentioned in case 3. The free carbon liberated in case 2 is light and fluffy, and of itself would not form the hard deposit. Where the compounds break up into new compounds, however, some of the new compounds are volatile, while others are heavier and more viscous than the original compound. Continued action of the kind mentioned in case 3 will therefore result in the gradual thickening of the film; and the retention and absorption by the film of the carbon that is liberated will increase this effect until, finally, a hard, brittle deposit results.

In the absence of any gummy deposit of this kind to cement the free carbon together, the latter will generally be blown out through the exhaust. The oil that will give the best results, then, is not necessarily the one that will form the least carbon, but the one that will form the least carbon in the cylinders.

Oils made from the Southern-asphalt-base crudes have shown themselves to be much better adapted to motor cylinders, as far as their carbon-forming proclivities are concerned, than are the paraffin-base Pennsylvania oils. The carbon formed from the latter is, as a rule, extremely hard and clings to the metal surfaces, while that from the former is soft and can easily be wiped off any surface that it is deposited on. This would be expected from a consideration of the nature of the hydrocarbons composing the oil, and it has also been demonstrated in practice.

The explanation lies in the fact that the paraffin-base oils are generally composed of the paraffin series of hydrocarbons, while the asphalt-base oils are composed mainly of the ethylene and napthene series. One of the characteristics of the latter two series as compared with the paraffin series is their tendency to distill without decomposition. Consequently no gum will be formed on the cylinder walls, and the carbon liberated will be mostly discharged with the exhaust gases.

Little Difference in Light Oils

In the light grades of motor oils there would probably be very little difference between the two varieties, but in order to get oils with a high viscosity in the paraffin brands it is necessary to compound the light oils with cylinder oil in different proportions. The presence of this cylinder oil is what is responsible for most of the gumming and this explains why the heavy oils give so much more carbon trouble than the light oils. Oils from an asphalt base can be made with viscosities sufficiently high to make it unnecessary to compound them with cylinder stock.

Some oil companies, in their advertising, lay great stress on the color and specific gravity of their oils. The color of an oil has no relation to its lubricating value. About the only information of any value that can be obtained from noting the color is whether or not it is a light oil compounded with a cylinder oil. If such is the case it shows the familiar greenish tinge of the cylinder oil.

The specific gravity is of no practical value to the consumer. The producer uses it to advantage in his refining. It might be used in conjunction with the flash point to determine what particular kind of crude a straight oil is made from, but it would take almost an expert to do this.

It will generally be found the best policy to use a lighter oil in winter than in the summer. There is generally very little difference in the working temperature of the cylinder walls in winter and summer, but the temperature of the crankcase will show very great differences. If the oil is very viscous, due to low temperature, it will not splash very easily and too little oil will be supplied the cylinders. This will be particularly apparent when starting the engine. The cold point, which is the temperature at which the oil freezes, should be sufficiently low to insure that no difficulty will be encountered at the temperatures to which the crankcase will be exposed. Otherwise it is of little value. The asphalt-base oils have a lower cold point than the paraffin oils. The heavy oils are usually the only ones that have cold points that are not sufficiently low.

The amount of oil necessary for the lubrication of motor cylinders depends on so many factors that no data can be given, and it will be necessary to solve the problem for each individual motor. The heavier the oil the less the amount that will be used; also the tighter the piston and rings the less will be used. It is also well to remember that to use more than is necessary for proper lubrication simply aids in the formation of carbon.

Two-cycle motors can be successfully lubricated by mixing the lubricating oil with the gasoline in the gasoline tank. The proportion generally used is about 1 pint of oil to 5 gallons of gasoline. In this method of lubrication the oil must vaporize in the carbureter and be carried with the gasoline vapor into the cylinder, where it will condense on the walls. In choosing an oil for this method of lubrication attention should therefore be paid to the characteristics governing its vaporization.

Gasoline, kerosene, lubricating oil and most all other products obtained from crude oil consist of a large number of different kinds of hydrocarbons, each of which has its own boiling point. When the oil is heated the lighter hydrocarbons will first vaporize, being followed by the others as their boiling point is reached.

If we take a mixture of gasoline and lubricating oil and heat it so as to cause it to vaporize, the gasoline will be driven off and the oil will remain, unless we select such conditions that the oil will also vaporize without leaving any residue. In the carbureter conditions are made very favorable for vaporization, but it will help appreciably if an oil is selected that has a low flash point and is easily vaporized. The writer has in mind a case that was brought to his attention a few days ago of a motor-boat engine that gave considerable difficulty owing to the oil congealing in the carbureter in cold weather.

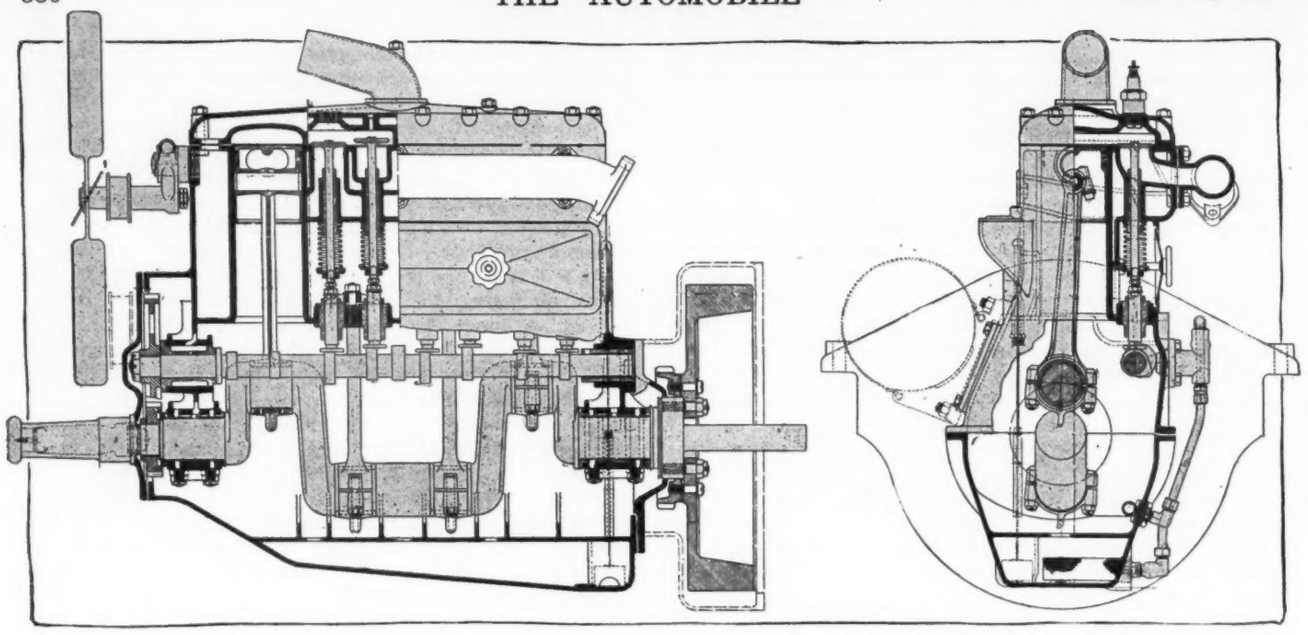
The study and application of the foregoing principles to the selection of a motor oil for use in any particular engine should enable anyone to obtain an oil that is suited to that engine. It should also clear up some of the obscurity regarding the reasons why an oil will work well in some engines and will not in others. The writer believes that the formation of carbon in the cylinders of internal-combustion engines is an evil that can be prevented by a little study of its causes.

—

Oil Changes for Temperature and Wear

THE USE OF OIL of a different grade in summer as compared to the grade used in winter is not now as common as it was a few years ago due to an increased tendency on the part of the car user to merely demand a medium oil from the garage he happens to be passing, dumping that into the crankcase and letting the results take care of themselves. Not a few makers recommend the use of a lighter grade of oil in winter than in summer owing to the fact that the oil has to work at an entirely different temperature due to the increased average temperature of the cooling water.

A tendency which is increasing and which is meritorious is the use of oils with heavier viscosity for worn cylnders. The ability of an oil to maintain the dual oil film—on piston and cylinder is sorely taxed if the viscosity is low and the clearance high. For this reason an engine which in its earlier days of perfect condition was qualified to use a medium or light oil will be better lubricated after wear by a medium or heavy grade.



Longitudinal and transverse sectional views through the new Wisconsin four-cylinder L-head passenger car motor with detachable head

Two Four-Cylinder Wisconsin Motors

New Car Type L-Head Block—Truck, T-Head Pairs

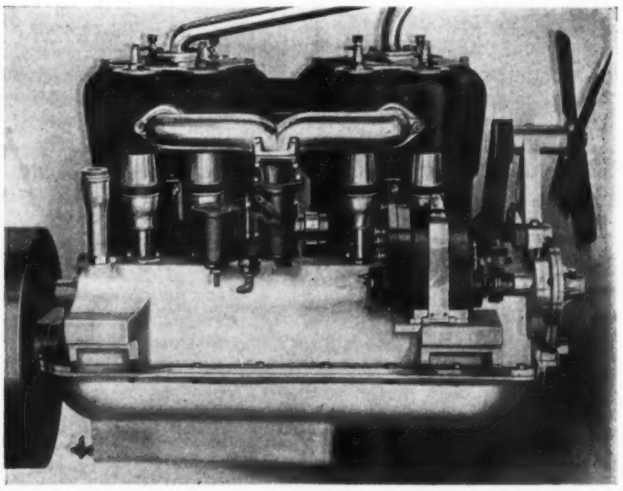
TWO new motors, one a passenger car design with a detachable head and the other a truck motor, have been brought out by the Wisconsin Motor Mfg. Co., Milwaukee, Wis. Both these models are additions to the complete line made by the Wisconsin company but do not differ materially in the methods of construction from the previous designs made by this concern. The passenger car model is known as type Q and has four 3.25 by 5-inch cylinders. The type J truck design has also four cylinders and the dimensions are 5.1 by 5.5.

Referring to the type Q passenger model the four cylinders and upper part of the crankcase are cast in a single block of gray iron. The waterjackets are carried entirely around each cylinder and also, as will be noted from the sectional view, extend well around the valve space, only a small portion of the valve guide surface being unprotected by the waterjacketing. The cylinders are aged after boring to eliminate the internal casting strains before the finish grind is applied. On this model the cylinder head is cast separately in accordance with growing practice, and is held on by large studs. Tightness between the cylinder and head is maintained by a metal gasket. The independent head construction is used by the Wisconsin concern because it is their belief that the cylinder cores can by this method be made more uniform and a percentage of wasted castings greatly reduced. Furthermore, from a user's standpoint the valves, pistons and cylinder heads can be readily cleaned by removing the cylinder head casting.

The lower half of the crankcase is made of a nickel aluminum alloy and is so designed that when removed the crankshaft and connecting-rod bearings are readily accessible.

In piston practice this motor is up-to-date in the use of the multiple ring system. The pistons are made of the same grade of metal as the cylinders and are ground to finish size and fitted with eight narrow steel expansion rings which are ground on both faces and on the outside. In this system of piston rings a careful fit must be made both in the grooves and in the cylinders and this is done by a finish grinding process to extremely small limits. As part of the balance scheme all sets of pistons and connecting-rods intended for the same motor are weighed against one another and balanced when assembled with the connecting-rods.

The piston pins are case-hardened and ground. They are clamped in the ends of the connecting-rods and have their bearings in the piston bosses, this method being chosen because of the greater amount of bearing surface permitted and, according to the Wisconsin company, advantages are also secured in piston pin lubrication. I-beam connecting-rods of .35-.45 per cent. carbon steel drop-forged and heat-treated



Carbureter side of the Wisconsin truck motor made in T-head pair cast form

transmit the thrust to a 2-inch chrome nickel-steel crankshaft which is also a heat-treated drop-forging and has a tensile strength of 125,000 pounds per square inch. This is a two-bearing design, the lengths of the bearings being liberal to take care of any tendency toward whipping on the part of the shaft. The rear bearing is 3.5 inches long and the front bearing 3.25 inches. The diameters of these bearings are 2 inches. Both the main bearings and the four crankpin bearings are ground to size all being 2 inches in diameter. Running balance of the crankshaft is secured by the use of the Norton running balancing machine.

Cams Tested by Scleroscope

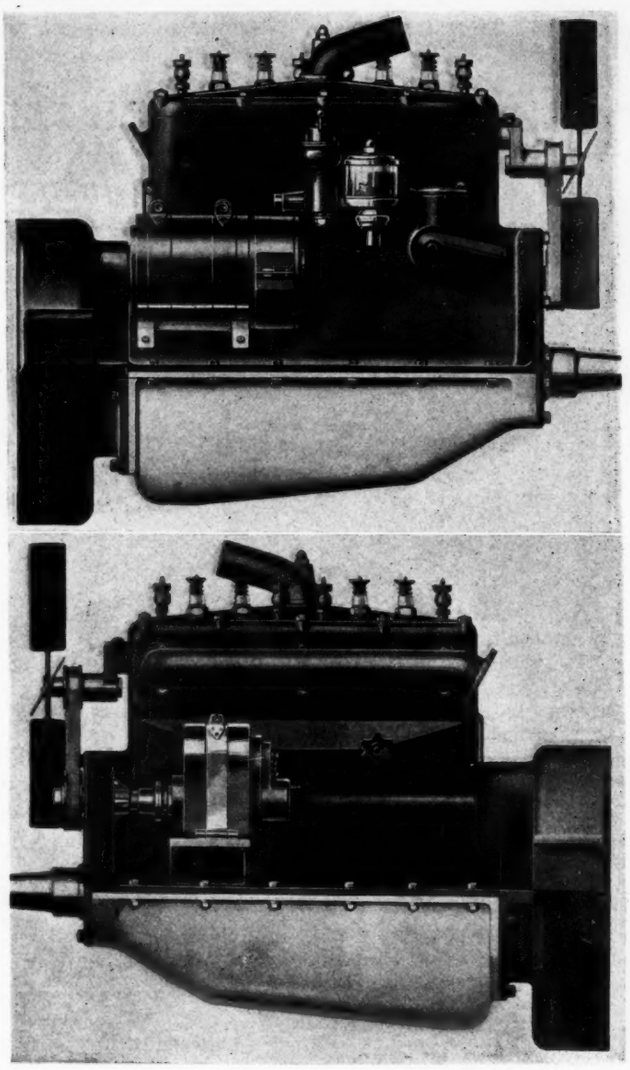
The camshaft is also a drop forging carrying the cams integral on the shaft. The material used for this is a low carbon steel and it is carried in phosphor bronze bearings which contain oil pockets cast directly in the bearing thus taking care of the lubrication of the camshaft. The entire shaft after having been turned to finish size and having the cams rough-machined is carbonized and hardened. It is then finish ground to accurate size on a camshaft grinding machine, the cams then being tested on a scleroscope for hardness. The carbonizing, however, is sufficiently deep as not to be removed by the finish grinding. A feature of this camshaft is the ease with which it may be removed from the motor by taking off the timing gearcase cover and pulling it directly out.

The entire valve mechanism is carried on the left side of the motor, the valves being operated by a single camshaft with the cams bearing directly on flat push rods. The bearing contact between the cam and follower is off center allowing the disk-shaped follower to turn on its axis, spreading the wear over its entire surface. Both intake and exhaust valves are interchangeable, being 1 11-16 inch in diameter and having nickel-steel heads electrically welded to carbon steel stems. The valve stem guides are removable and can be easily replaced in case of wear. They are made softer than the stems so that all the wear will be taken on the cheapest part. The tappet guides are also separate castings and can easily be removed, being held in place by means of a forked forging. By loosening this the complete tappet assembly, including the guide, can be taken out without disturbing other parts. A removable metal plate covers the valves and, being dust-proof, keeps them clean and also renders the action quiet.

Helically-cut timing gears are employed. They are semi-steel against steel and are cut on automatic hobbing machines. The set comprises a crank gear, a cam and a magneto gear. These are all housed in the customary manner at the forward end of the motor.

No intake manifold is used, the carbureter being bolted directly against the side of the cylinder on the opposite side from the valve mechanism. A cored passage leads the gases across the cylinders and allows the gases to become heated by the water which passes around them. The exhaust manifold is located on the opposite side from the intake and is carried some distance out from the motor to insure its freedom from the other parts. The center line of the exhaust manifold is 6.875 inches from the center line of the motor. This does not in any way interfere with its mounting as it falls well within the motor-supporting flanges. The breather pipes are in the valve stem cover plates, allowing the breathing action of the motor to operate through the valve stem housing, thus carrying with it a supply of oil in the form of a vapor which insures the lubrication of the valve stems.

Lubrication is accomplished by a circulating splash system in which the circulating medium is a plunger pump accessibly located on the sides of the motor and driven off the camshaft. This pump takes the oil from the reservoir in the bottom of the crankcase and forces it through a duct to troughs under the connecting-rods. The oil is picked up by the rods and enters the connecting-rod bearings through openings in the lower caps. The rods also throw the oil into pockets over the main bearings and camshaft from which it feeds through drill passages to the bearings. The rods also throw the oil into a pocket in the rear face of the crankshaft gear and in addition oil is fed into this pocket from the front main bearing. From this recess the oil is thrown by centrifugal force through drilled holes directly into the gear teeth. The oil filler is cast integrally with the cylinder and the oil gauge is located on the same side of the motor as the oil filler, that is, on the valve side.



Both sides of the new Wisconsin passenger car motor with detachable cylinder head. Note carbureter mounting

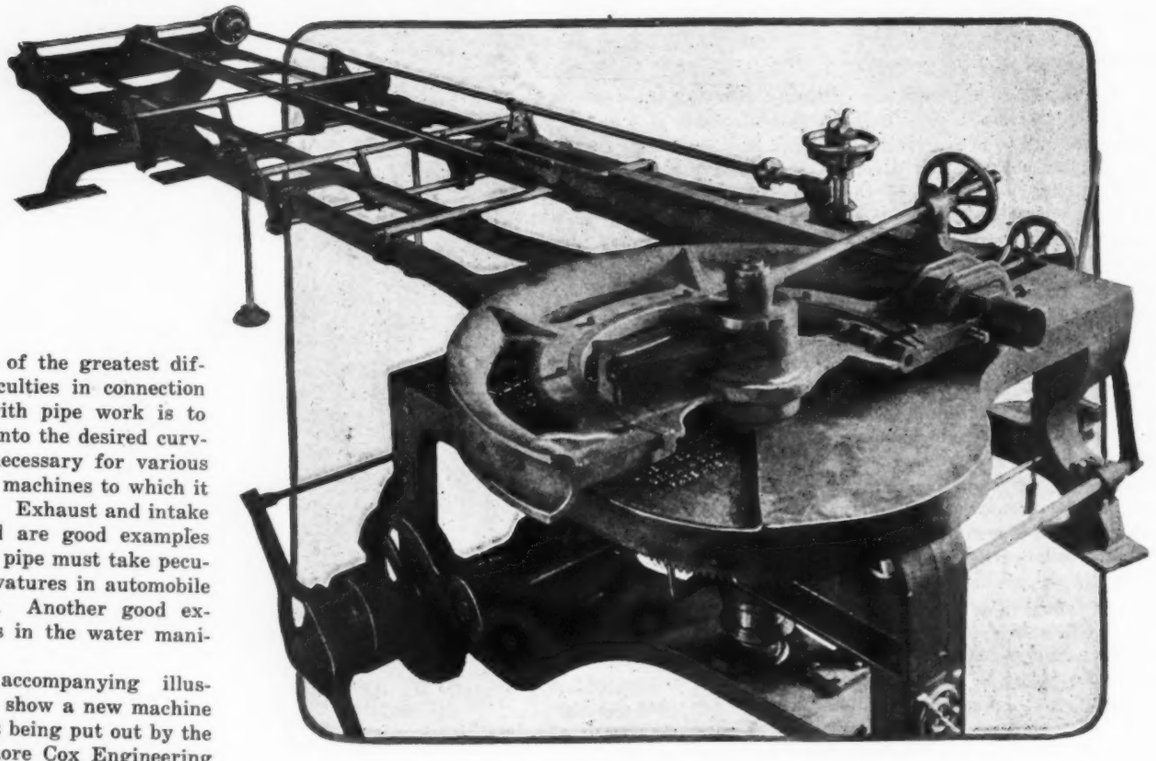
The Truck Motor

In the new truck motor type J the same method of construction is used throughout, although the materials and dimensions differ, naturally, on account of the difference in the type of the motor with its heavy duty construction. In this motor the cylinders are cast in pairs with unit cylinder heads. The pistons are fitted with three rings and are eccentric. The piston pins are of hollow tool steel, ground and hardened and fastened to the connecting-rods by means of bolts, thus providing maximum bearing surface.

The crankshaft is chrome nickel steel and the camshafts, of which there are two, are 40 per cent. carbon steel forgings with the cams integral.

Machine Makes Intricate Pipe Bends

Replaces Men and Inaccurate Methods and Permits of Accuracy in Results—Saves Much Time on Heavy Work



Illustrating the automatic stop, power safety clutch, quick change tool system, etc., which renders this machine a great time saver

ONE of the greatest difficulties in connection with pipe work is to bend it into the desired curvatures necessary for various types of machines to which it is fitted. Exhaust and intake manifold are good examples where a pipe must take peculiar curvatures in automobile practice. Another good example is in the water manifolding.

The accompanying illustrations show a new machine which is being put out by the J. Fillmore Cox Engineering & Tube Bending Co., Bayonne, N. J. This company specializes on the manufacture of pipe-bending machinery and at the present time is putting out twenty-one different types and sizes ranging from a small hand portable bench machine such as an electrician or plumber would use in his daily work to a large motor-driven hydraulic instrument for heavy pipe sizes. The machine herewith described operates on pipe and tube from a 3-inch radius on 1-inch pipe up to a 6-foot radius on 4-inch pipe without any filling.

Bends Tube of Any Size or Shape

The new machine operates on any shaped pipe or tubing, making any shape or style of bend. It handles equally well flats, squares, solids, channel and I-beam sections or angle T and diamond shapes. After being set up the machine can be operated by a boy, and the company claims that where a large amount of pipe work is being handled the machine will do the work of twenty men with little expense. In such work as heavy production in any line or in jobs where a great amount of pipe work is required this machine will be of the greatest value.

A great amount of work is necessary in bending heavy piping and to do this work a reliable source of energy must be secured. In the ordinary installation the Cox company uses a 5.5 horsepower General Electric motor of the variable-speed reversible type. This is used in connection with a drum controller and with this combination the required flexibility of control is secured. In pipe bending the power application is spasmodic and this puts a very difficult load upon the source of energy. One instant the machine will be passing over a section of straight pipe where no work is required for bending and the next instant a quick bend will require a heavy torque.

The old methods in bending pipe, especially in steam installations or on boats, consisted in making templates of the bend necessary and then bending the pipe to fit the template. The pipes would generally be bent hot and after they cooled would be found to be some distance out of shape. With the motor-driven bending machine the pipe is bent cold and the finished job is accurate. Even bent boiler tubes can be reproduced exactly with this instrument.

The finished machine is stated by the manufacturers to be the result of 15 years experimenting and embodies a number of improvements in control. Complete guidance of the machine is had from one position of the operator and in addition the fittings of the instrument include an automatic degree stop, emergency lever, starting lever, safety clutch, clutch control, quick-setting arrangements, reverse stop, quick change of tool system, special duplicating devices and a quick power release.

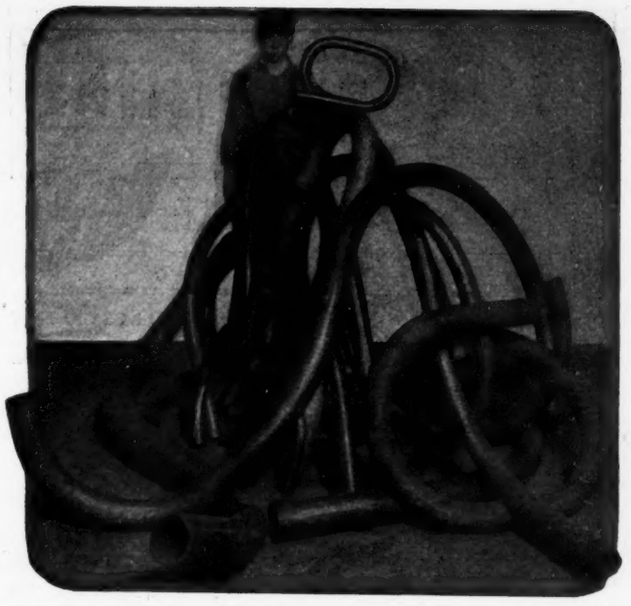
Some of the particular applications of this machine for automobile work include manifolds, exhaust pipes, fenders, tubular supports, etc. In ship work the steam-heating pipes are a good example.

An idea as to the speed of the machine may be had from

the claim that a U bend may be made with threads on both ends on a 4-inch pipe of iron or steel centers 18 inches apart in 1 minute's time. This is a net saving of .5 minute over the previous records made with the belt-driven machine manufactured by the same company. Tests made upon the U bend for accuracy showed that it was correct to within .003 inch. On the same instrument lock-joint steel tubing of 22 gauge has been bent perfect to a 4-inch radius with 2-inch material, and to an 8-inch arc around the curvature of 180 degrees.

With the full attachments as fitted to the machine several different sorts of bend may be made at the same time and when used in connection with the magazine arrangement radial bends are produced automatically, it being only necessary to feed the material in properly cut lengths. Each bend will then be a duplicate of every other.

In the work done on this machine the pipe and tube bending is divided into four general classes. These are conical helices, open and closed coils, radial and die bends. All of these can be produced accurately with the fittings that come with the machine. The bends in the piping shown in the accompanying illustration have all been made cold and without filling. They range from 1 up to 6 inches and consist of various material, and radius from 3 inches up to 3 feet. The time consumed in making these bends is from .5 minute to 2.5 minutes per bend. Some of these bends would ordinarily require the services of from three to four men and then would use considerable gas or fuel of some kind for heating. At the end of 5 or 6 hours the bend would be as close as possible but even at that it could not be perfect under ordinary circumstances. Any shape, style or size bend can be made on machine so it may be put to many general uses and fill many requirements about the factory in a general way besides making the standard parts of cars.



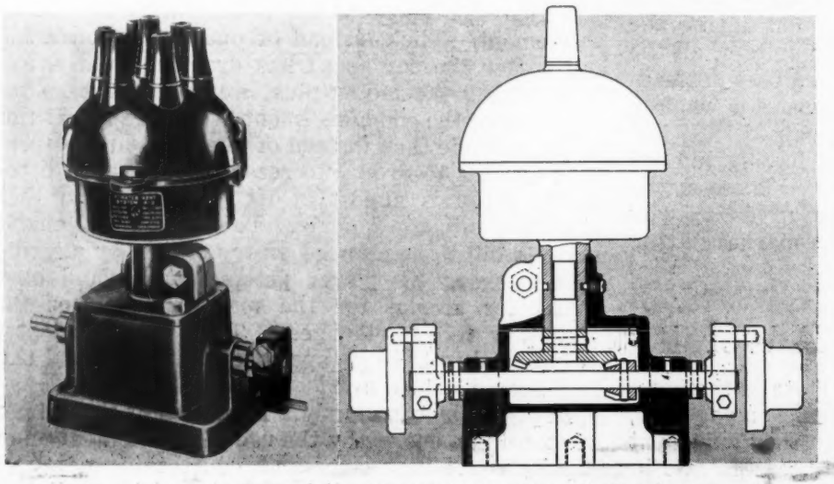
Most of the large bends shown in this photograph are too big for automobile use, but there are a few quite small angles in fairly small pipe to be seen about the middle of the heap. The very wide capacity of the tool makes it typical of a most interesting class of machine that is exercising powerful influence upon the design of all sorts of manufactured articles. Often where castings or forgings would have been employed a year or two ago, we now find tubular or sheet metal parts prepared with much less wastage of material by bending, pressing or spinning machines. In almost every case the new part is better than the old as well as being cheaper to make and considerably lighter in weight

Atwater Kent Igniter Is Interchangeable with Magneto

THERE are many occasions when it is convenient to replace an old magneto by a new timer for working in conjunction with a battery system, and there are many more when it is a great convenience to a manufacturer to be able to fit either kind of ignition without the smallest of changes to the motor.

With this idea in mind the Atwater Kent Unisparker is now being made by the Atwater Kent Mfg. Works, Philadelphia, Pa., with a standard magneto base and a horizontal shaft drive which is so proportioned that it can be coupled easily to the magneto driving spindle or shaft. The new fitting is illustrated below, the sectional view showing the bevel driving gears and the construction of the base, while the photographic reproduction gives an idea of the general appearance of the complete unit.

Both a plain pattern of Unisparker and another design with automatic ignition point control are made, but the details of the governing mechanism are in no way different from the ordinary Atwater Kent outfit. The makers inform us that the type with automatic advance and retard weighs 7 1-2 pounds complete, and the other kind with hand advance 5 1-2 pounds; so the apparatus is light enough in either case.



Right—Part section through new Atwater Kent igniter. Left—Exterior view

Of course, the coil is a separate unit and has to be mounted separately, the customary place being on or adjacent to the cowl board. All the attachments are simple, however, and no special electrical skill would be necessary to re-equip an old car with the new outfit which, incidentally, is not expensive to buy and easy to install.

In connection with this new style of igniter the usual Atwater Kent features are retained, that is to say the contact maker is the well tried design with single tungsten contact points, while the switch and coil designs are unchanged also. Where cowl board space is limited there is a special pattern of coil provided for mounting beneath the hood.

Of course the demand made upon the battery by adding ignition to its regular duties of lighting and starting is too small to be worthy of the slightest consideration, and even when the battery is partially discharged so that it has not power enough left for heavier work it will continue to operate the ignition without missing fire, even under unfavorable conditions.

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1,754,570 Cars and Trucks

IF the solons of the stock exchange, who recently advocated an investigation into the reason for the phenomenal strength and steady gain in value of automobile and allied securities, had glanced over the registration statistics for 1914 they would have found their answer. A gain of over half a million cars and trucks in 1 year, or 41.7 per cent., means a largely increased output as compared with previous records, production having gained 14.4 per cent. The industrial reports from various sections of the country published in THE AUTOMOBILE during the past 2 months have indicated that in spite of all the hard-time talk people have been buying cars in steadily growing numbers. Our car census is rapidly nearing the 2,000,000 mark, having gained 1,077,570 registrations in 4 years, production having jumped in that time from 209,957 to 515,000. These statistics answer conclusively any question as to why automobile stocks have featured the market during the past few months.

Prosperity Amidst Adversity

THE curves showing the healthy state of the automobile stock market, which appear on page 557, are really far more remarkable than they appear at first glance, because the prosperity they indicate in almost every case has little or nothing to do with warfare. Perhaps the rubber concerns have been steadied by the demands of the armies, but the big passenger car productions are in spite of the war and not by any means because of it. We know that all over the world people are cutting down personal expenses, and that in such a cutting it is the luxuries and pleasures that make the first splash overboard. Just a few years ago this war would have crippled the automobile trade horribly, but now it is demonstrated beyond all doubt that the car is not in the class of personal belonging that can be called luxurious. If it has not become an absolute necessity—and of course it is not this in the majority of cases—it has become one of the things that the man who can afford it is not going to try to do without; rather, one may suspect, he would cut other pleasures and do positively more motoring. To those who helped the automobile through its early days of stress and trouble the present position is extremely gratifying because the new industry for the establishment of which the pioneers labored has now shown its power to keep employed the millions who now depend upon it for their living despite a trade depression in some quarters unparalleled in the history of the world.

Driving a High-Speed Motor

WITH a high speed engine the peak of the power curve is well above 2,000 revolutions and often runs up to nearly 3,000, especially on small motors, so, for equivalent climbing power, the smaller motor must be allowed to revolve more rapidly. Partially this is accomplished by dropping the top speed gear ratio a little so that the peak of power on the direct gear is reached at the same road speed as it used to be with the low speed motor and higher gear ratio, but this does not mean that the new car is thus put upon all fours with the old.

If we let the car slow down from the speed at which the gearing makes the high speed motor the exact equivalent of the low speed, we shall find that the power falls off more rapidly with the smaller engine, because the curve of horsepower flattens out towards the top and, in coming *down* the curve the steeply descending part is sooner reached with the low geared, high speed motor than with the old arrangement. Thus instead of opening up on a hill only after the car speed has dropped greatly, and then letting the motor plug, we ought to keep the speed up at the commencement of the grade. If this is not possible then instead of plugging on top speed it is quicker to drop into second, accelerate till the motor speed is almost at its maximum and then slip back into top quickly. This action will enable many a hill to be climbed on top which, by sticking to each gear till power petered out, would have called for second for the major portion of the ascent, or even for low gear. The high speed motor is intended to have its speed capacity used and this fact should not be overlooked.

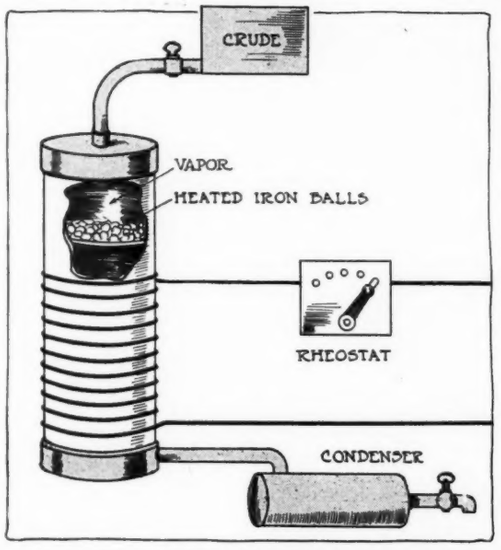
In principle it is merely a repetition of the old law of storing up energy by the use of the momentum of rapidly revolving parts and when this energy is placed at our disposal it is a waste not to use it.

Rittman Vaporizes Petroleum in Still

Little Heat Applied to Liquid Itself in Container—Process Perfected Only on Laboratory Scale, But Commercial Requirements Have Been Provided for—To Prevent Monopoly

WASHINGTON, D. C., March 20—A detailed description of his process whereby the product of gasoline from petroleum can be tripled has been given by Dr. Walter F. Rittman, of the federal bureau of mines. "The process has been perfected on a laboratory scale; it has not as yet received the test of operation on a commercial scale," said Dr. Rittman. "But the results have been as carefully checked and every step, every phase of the process has been subject of such minute scrutiny that, even before a single foundation stone has been laid for the first plant that will make use of the new process, it is scientifically safe to say that the process of producing gasoline from petroleum has been revolutionized in at least many particulars.

"In every type of distilling apparatus in use at the present time the same ancient fundamental principles are followed. The body of the still is some form of vessel for containing the liquid to be distilled. Some kind of tube leads from the upper part of the still to the condensing apparatus and heat is applied to the liquid from beneath. In this manner the temperature of the liquid is raised to a point where it becomes partly vaporized, the vapor passing out of the tube, or 'worm' to the condenser. In other words, the liquid itself is distilled. This means that temperature limitations have to be observed or an explosion is likely to occur. Furthermore, the temperature limitations render it impossible, under present methods, to recover all the valuable products.



Diagrammatic illustration of the Rittman process

"In the new process no heat is applied to the liquid itself in the container. The liquid to be distilled, speaking particularly of petroleum, is contained in a feed tank from which it is fed into the still. There it is vaporized and the vapor, not the liquid, is then distilled.

"The new form of still is, generally speaking, cylindrical in shape. An inlet tube leads into the still from the container holding the liquid. This tube is equipped with a cock by means of which the flow of the liquid, petroleum, is regulated. In the upper part of the still is placed a number of small iron balls, which are heated to a temperature sufficiently high to vaporize the oil as it flows over them from the inlet tube. The vapor thus formed is forced down into the lower portion of the still by the continual formation of more vapor above.

Electricity for Heat

"A series of wires conveying a powerful electric current wound about the lower portion of the cylindrical still, with resistance coils, furnishes the heat for distilling this vapor. The heat can be regulated to any desired temperature. The fact that the expansion of vapor under heat is a definitely known equation, whereas nobody ever knows what a mixture of vapor and liquid is going to do, illustrates the value of the safety factor of the new process. The vaporized oil, distilled at the proper temperature, passes into the condensing apparatus—and that is all there is to the new process.

"But when it comes to discussing the possibilities of this new process, that is another thing. By its use we can utilize material that is absolutely wasted under the old process of distillation. We can obtain a larger volume, therefore, of gasoline from a given quantity of oil and we can do it in a third of the time required by the old process and without any of the danger attending the operation of old-fashioned stills through the possibilities of conflagration.

To Prevent Monopoly

Patents covering every phase of the new process have been applied for and these patents, which will absolutely prevent monopolization of the process or any part of it by private interests, are to be vested in the government for the benefit of the whole people of the United States. Companies which desire to avail themselves of the new process may do so only on license from the government or under government supervision. Every safeguard is to surround the granting of such license, so that the development of a monopoly will be impossible.

Already scores of refining companies and individuals have asked upon what terms the government will permit them to build and operate refining plants under the patents covering the new process. As yet no plan has been perfected but it is expected before the middle of the coming summer not one but a dozen or more big refineries will be in process of construction. It may be that one or more such plants will be in actual operation before half the summer has passed.

To Discuss Standard Truck Service Policy

NEW YORK CITY, March 22—At the motor truck convention to be held May 5 and 6 at Detroit by the National Automobile Chamber of Commerce, there will be a paper on, Can Manufacturers Have a Standard Service Policy?, by Alvan Macauley, vice-president and general manager of the Packard Motor Car Co., Detroit, Mich., and also a member of the Commercial Vehicle Committee of the N. A. C. C. This paper will treat of the co-operation of the manufacturer and dealer with the truck user to insure the most satisfactory and economical operation of the vehicles. It is planned to present for discussion a form embodying the provisions of a service policy that has been in successful use by the Packard company during the past year and to have the convention recommend the form, with such modifications as may be agreed upon, for adoption as a standard.

A dozen or fifteen other papers on questions to which the manufacturers of commercial vehicles have been seeking solutions for the last year or two are provided for on the program the Commercial Vehicle Committee is preparing.

Chevrolet Buys 2nd Tarrytown Plant

Will Be Used for Manufacture of $490 Car—Last of Four Maxwell Factories in East To Be Sold

NEW YORK CITY, March 22—The Beekman avenue plant in Tarrytown, N. Y., formerly occupied and owned by the Maxwell-Briscoe Motor Co., has been sold to the Chevrolet Motor Co., of New York City. The plant comprises about 20 acres and the buildings contain about 150,000 square feet of floor space. The property, which was held at $250,000, will be used for the manufacture of the $490 car and will, beginning June 1, produce about 5,000 of this model a month. The company expects to turn out 14,000 of the larger models a month at its three plants in New York City, Tarrytown and Flint, Mich.

The Beekman avenue property was one of the large plants included in the properties of the U. S. Motor Co., which, when liquidated, turned back its holdings into the original companies, so that the Maxwell-Briscoe Motor Co., one of the concerns in the U. S. Motor Co., received this property. This company then offered this plant for sale, together with three other plants here in the East, including one at Providence, R. I., one at Hartford, Conn., and one at Tarrytown.

The sale of the last Tarrytown plant winds up the sale of all the plants of the Maxwell company in the East.

Yale & Towne's 1914 Earnings $663,898

NEW YORK CITY, March 20—The Yale & Towne Mfg. Co., this city, reports net earnings for 1914 of $663,898 as against $713,109 in 1913. After deducting payments on interest and depreciation, amounting to $212,050, the net profits amounted $451,848 as against $522,689 in 1913. The surplus amounted to $136,850 compared with $252,504 in 1913. The company paid out $314,998 in dividends in 1914 as against $270,105 in 1913.

The balance sheet shows cash and receivables of $1,405,786 against $1,368,573 last year, and a profit and loss surplus of $4,436,786 compared with $5,981,110 for the previous year.

The report says that the decrease in volume of business in 1914 was almost wholly due to the influence of the European war on the company's export business.

The company has declared the usual quarterly dividend of 1 3-4 per cent., payable April 1, the books closing March 25 and reopening April 1.

Market Reports for the Week

NEW YORK CITY, March 24—Market prices this week were generally steady with few changes. The scarcity of tin and Great Britain's embargo had a lot to do with the unsettled condition of the local tin market. The embargo caused a flurry resulting chiefly in causing dealers to keep their hands off the product until there are further developments. Tin experienced a sudden drop on Tuesday to $51 a ton, after having risen to $53.50 on Saturday. A further cut of 5 cents was made by Pennsylvania petroleum this week. This reduction to $1.40 a barrel has been anticipated for some time. In some quarters it is regarded as the first of other reductions to follow. Overproduction in the western fields and the disturbed condition of the export trade are the most depressing features. The rubber market this week was quiet with no new developments. A large quantity of plantation rubber from London was reported yesterday, but this had no effect upon the situation. Fine Up-River Para went up to 59 cents and stayed at that price until Tuesday, when it dropped to last week's price, 58 cents.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Changes
Antimony	.21	.21½	.21½	.21½	.21½	.21½	+.00½
Beams & Channels, 100 lbs.	1.26	1.26	1.26	1.26	1.26	1.26	.....
Bessemer Steel, ton.	18.00	18.00	18.00	18.00	18.00	18.00	.....
Copper, Elec., lb.	.14¾	.14⅞	.14⅞	.14⅞	.14¼	.14¼	—.00½
Copper, Lake, lb.	.15	.15	.15	.15	.14⅜	.14⅜	—.00⅝
Cottonseed Oil, bbl	6.65	6.70	6.60	6.55	6.55	6.60	—.05
Cyanide Potash, lb.	.21	.21	.21	.21	.21	.21	.....
Fish Oil, Menhaden, Brown	.41	.41	.41	.41	.41	.41	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.92	.92	.92	.92	.92	.92	.....
Lead, 100 lbs.	4.10	4.10	4.10	4.10	4.10	4.10	.....
Linseed Oil	.62	.62	.62	.62	.62	.62	.....
Open-Hearth Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Petroleum, bbl., Kans. crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa. crude	1.45	1.45	1.45	1.45	1.40	1.40	—.05
Rapeseed Oil, refined.	.75	.75	.75	.75	.75	.75	.....
Rubber, Fine Up-River, Para	.59	.59	.59	.59	.59	.58	—.01
Silk, raw, Ital.	..	3.90	..	..	3.90	3.90	.....
Silk, raw, Japan	..	3.50	..	..	3.50	3.50	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	53.00	53.00	53.00	53.50	53.00	51.00	—2.00
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

Electric Storage Battery Earns $848,628

PHILADELPHIA, PA., March 18—The Electric Storage Battery Co., this city, earned $848,628 in 1914, as against $1,035,917 in 1913. Gross sales amounted to $1,395,793 as against $1,558,123 in 1913. The total net income was $1,103,237 compared with $1,208,755 in 1913. The total surplus amounted to $3,690,069 as against $3,312,522 in 1913.

LANSING, MICH., March 19—The Reo Motor Car Co., this city, has declared the regular quarterly dividend of 2 1-2 per cent. on the common stock.

DETROIT, MICH., March 22—Since the announcement of the new models, February 1, the Packard Motor Car Co., this city, has received orders for over $1,250,000 in trucks.

NEW YORK CITY, March 18—At a meeting of the directors of the United States Rubber Co., held today, the following officers were elected for the ensuing year: President, S. P. Colt; vice-presidents, J. B. Ford and Lester Leland; vice-president in charge of development work, R. B. Price: vice-president in charge of tire and mechanical department, E. S. Williams; secretary, Samuel Norris; treasurer, W. G. Parsons; assistant treasurer, E. J. Hathorne, and assistant secretary, J. D. Carberry. The executive committee was re-elected.

N. A. C. C. Protests Tire Freight Increase

NEW YORK CITY, March 19—Efforts of the railroads to increase the rating on pneumatic tires in carloads from third class to second class is meeting with protest on behalf of the automobile manufacturers through the National Automobile Chamber of Commerce.

Following the horizontal increase of 5 per cent. in the rates applicable to these shipments, it is felt that any additional increase would be unfair, especially in view of the decreased value of tires as compared with the conditions when the third class rating was fixed. The increase from third class to second class would mean a substantial increase in the charges for carrying tires.

NEW YORK CITY, March 22—At the regular meeting of the Rubber Control Committee of the Rubber Club of America on March 18, it was reported that since the raising of the English embargo on the shipments of plantation rubber from London to this city and up to March 6, the receipts here amounted to 5,300 tons.

Akron Co. Takes on Tire Manufacture

AKRON, O., March 19—The American Tire & Rubber Co., this city, has started the active manufacture of automobile tires. The company is at present manufacturing only small-sized tires, but expects, however, to get into the larger sizes before the close of the season, and anticipates manufacturing a tire with a 4,000-mile guarantee.

The capacity of the company's plant will allow the manufacturing of from 100 to 500 tires daily, as well as from 500 to 1,000 inner tubes. The company is capitalized at $250,000 in common stock, having reduced the same from $500,000.

Champion Inaugurates Profit-Sharing Plan

TOLEDO, O., March 19—Marking the first appearance of the profit-sharing idea in fields other than those occupied by the automobile manufacturer, the Champion Spark Plug Co., Toledo, O., has put in operation a plan by which it will build up closer co-operation between itself and its dealers and at the same time materially stimulate the demand for Champion spark plugs. Under this plan, all the dealers will receive by check from the Toledo company an amount

in proportion to the number of plugs they purchase through their jobbers. Cards are now being sent to all dealers upon which is to be entered the number of plugs the dealer will sell during the year. Upon receipt of the card properly filled out and accompanied by the jobber's invoice from whom the plugs were purchased, the Champion company will mail the dealer direct a check representing his pro rata share of the extra profits.

It is pointed out that a dealer need not handle Champion plugs exclusively to be eligible under the profit-sharing plan, though he must take the number of plugs he enters on his card. These may include any of the standard Champion products such as the types for Ford and Buick, types O or X, Heavy Stone, Priming Plug and Motorcycle. That there is little danger of the dealer overstocking is made plain by the fact that any plug found unsalable during the year of its purchase may be exchanged for another type.

The Champion company is now producing an average of 26,000 plugs a working day, and it is expected that this profit-sharing plan will increase the output to 40,000 or more per day.

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CHICAGO, ILL., March 24—The Standard Oil Co. of Indiana has reduced the price of gasoline to 9 1-2 cents. The price in 1 year has been cut 5 1-2 cents, the present price giving only 1 1-2 cents gross profit.

Automobile Securities Quotations

NEW YORK CITY, March 24—Automobile securities continue to climb, so far, in fact, that they have caused an investigation to be made by the Police Committee of the New York Stock Exchange. Nothing startling developed out of this inquiry, the only reason for the strength of the stocks being that the automobile business at present is in a high state of prosperity.

The largest gain of the week was made by Ajax-Grieb common which rose 35 points; Willys-Overland common showed a gain this week of 9 points, this stock having risen since March 2 from 95 to 118, a gain of 23 points; General Motors continued to gain, both the common and preferred rising 3 points, the common making a new high mark during the week of 107; U. S. Rubber stocks were active last week, the common rising 3 1-2 points and the preferred, 1; and Stewart-Warner common, which has shown much strength lately, rose 3 points. Goodrich common rose 3 points for the week and 6 1-2 points since March 2. Maxwell Motor issues quieted down on Friday and Saturday then quickly rose, the common showing a gain of 2 1-4 points, and the first preferred, 1 point.

Firestone common, which is quoted higher than any other stock on the local exchange, experienced its first drop since January 14, that of 4 points. This stock has risen from 380 on March 2 to 396. The preferred, which is very steady, rose 2 points.

Quotations from the Detroit Stock Exchange show gains on the General Motors common and preferred of 7 and 3 points, respectively. Maxwell Motor stocks showed fractional gains.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Net Ch'ges
Ajax-Grieb Rubber Co. com	200	..	285	..	+35
Ajax-Grieb Rubber Co. pfd	98	102	100	..	..
Aluminum Castings Co. pfd	98	100	96	100	+2
J. I. Case pfd	..	..	78	82	+3
Chalmers Motor Co. com	..	83	..	81	..
Chalmers Motor Co. pfd	..	94	91½	93	..
Electric Storage Battery Co	..	..	49	50	+ ½
Firestone Tire & Rubber Co. com	285	292	396	402	—4
Firestone Tire & Rubber Co. pfd	108	109	110	112	+2
General Motors Co. com	75⅛	75¾	100	107	+3
General Motors Co. pfd	92½	93	99	99½	+3
B. F. Goodrich Co. com	23	23¾	37	38	+3
B. F. Goodrich Co. pfd	86	88¼	98	101	— ½
Goodyear Tire & Rubber Co. com	175	180	190	193	—2
Goodyear Tire & Rubber Co. pfd	94	95	104½	105½	..
Gray & Davis, Inc., pfd	90	97	..	..	..
International Motor Co. com	..	5	1¼	..	..
International Motor Co. pfd	..	15	8	..	..
Kelly-Springfield Tire Co. com	56	60	111½	112½	— ½
Kelly-Springfield Tire Co. 1st pfd	143	145	83	85	— ½
Kelly-Springfield Tire Co. 2nd pfd	..	..	118	125	..
Maxwell Motor Co. com	8	83¼	32¾	33¾	+2¼
Maxwell Motor Co. 1st pfd	32½	34	75	76¼	+1
Maxwell Motor Co. 2nd pfd	12	12½	30	31	— ½
Miller Rubber Co. com	..	..	165	170	..
Miller Rubber Co. pfd	..	..	101	103	..
New Departure Mfg. Co. com	106	108	128	130	+3
New Departure Mfg. Co. pfd	120	125	105	108	— ½
Packard Motor Car Co. com	101	116	80	90	..
Packard Motor Car Co. pfd	95	98	93¾	97½	— ¼
Peerless Motor Car Co. com	20	30	20	21	..
Peerless Motor Car Co. pfd	..	80	..	55	..
Portage Rubber Co. com	..	30	34	36	..
Portage Rubber Co. pfd	..	85	85	95	..
*Reo Motor Truck Co	7	8¼	11½	12¼	..
*Reo Motor Car Co	18¾	19¼	28½	29	— ¼
Splitdorf Electric Co. pfd	40	50	..	..	..
Stewart-Warner Speed. Corp. com	58½	60½	56	58	—1
Stewart-Warner Speed. Corp. pfd	99	102	101½	104	..
Studebaker Corporation com	28¾	29¼	48	49½	+1
Studebaker Corporation pfd	83	85	94	95	..
Swinehart Tire & Rubber Co	60	67	74½	76	..
Texas Co.	..	..	132	133	+ ½
U. S. Rubber Co. com	62	62½	58½	59½	+3½
U. S. Rubber Co. pfd	104	104¾	103	104	+1
Vacuum Oil Co	251	254	180	181	..
White Co. pfd	107	110	103	108	..
Willys-Overland Co. com	63	66	118	120	+9
Willys-Overland Co. pfd	89	94	99	101	..

*Par value $10; all others $100 par value.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Net Ch'ges
Chalmers Motor Co. com	..	83	..	81	—1
Chalmers Motor Co. pfd	..	94	90½	92½	—1
General Motors Co. com	74	76	105½	107½	+7
General Motors Co. pfd	92	93	99	100	+3
Maxwell Motor Co. com	8	8¾	32	33¼	+ ¼
Maxwell Motor Co. 1st pfd	32	35	74½	76	+ ½
Maxwell Motor Co. 2nd pfd	12	13	30½	32½	..
Packard Motor Car Co. com	101	116	80	90	—7½
Packard Motor Car Co. pfd	94	98	93¾	97½	..
*Reo Motor Car Co	18½	20	..	28¾	— ¾
*Reo Motor Truck Co	7½	8¼	11½	12⅛	..
Studebaker Corp. com	..	..	47	48½	— ½
Studebaker Corp. pfd	..	..	92	94½	—1½
Continental Motor Co. com	..	165	..	185	..
Continental Motor Co. pfd	..	75	..	85	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	21	..	25	..
Ford Motor Co. of Canada	540	560	525	..	..
Kelsey Wheel Co	191	195	190	200	—5
*W. K. Pruden Co	..	21	19	20½	..
Regal Motor Car Co. pfd	..	50	..	25	..

BONDS

General Motors Notes 6s, 1915	100¼	101¼	104¾	..	..
Packard Motor Car Co. 5s, 1916	..	98	95	..	..

*Par value $10; all others $100.

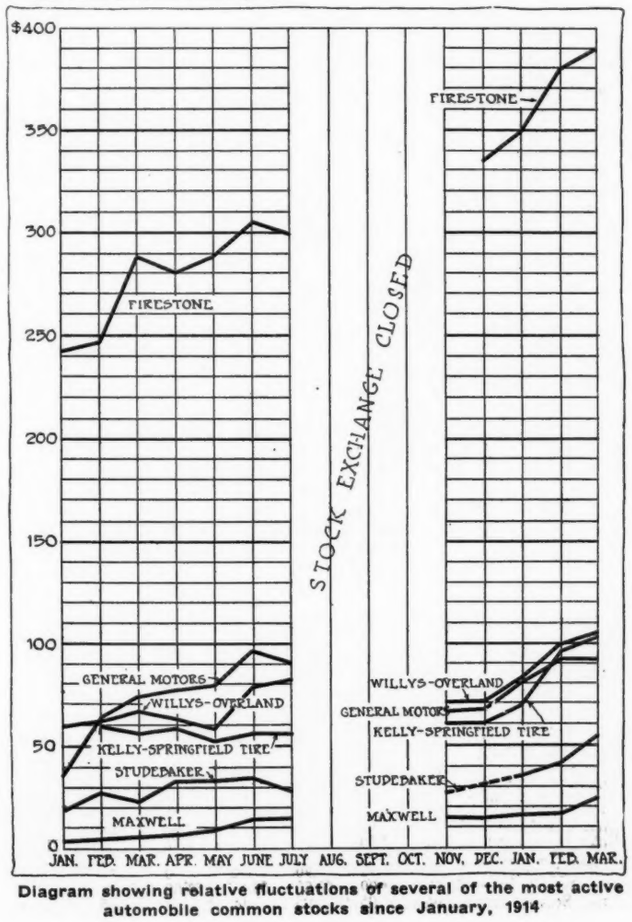

Diagram showing relative fluctuations of several of the most active automobile common stocks since January, 1914

New Transmission to Cheapen Electric

Dr. Steinmetz States Invention Will Hasten Advent of $750 Car He Predicted Last Fall

NEW YORK CITY, March 24—A little less than a year ago Dr. Charles P. Steinmetz, one of the foremost electric engineers in this country, speaking at the national electric convention, predicted the coming of 1,000,00 cheap electric cars to take care of the bulk of motoring in cities. He said that in his opinion this large number of electric cars would be in existence in less than 10 years, and that both the users and the central station interests would benefit mutually.

It seems that matters are not being left alone by Dr. Steinmetz to develop by themselves, but that he will take an active part in the production of the vehicles necessary to fulfill his prophecy since he now announces the existence of a simplified power plant which is being perfected under his direction, and which he expects will play an important part in the difficult task of cutting down the cost of making an electric passenger car.

Both Fields and Armature Revolve

Briefly, the new device consists of an axle design incorporating the motor, and with a minimum of gearing; this leaving merely the controller and battery to be mounted on the car itself. It is realized that one of the manufacturing difficulties which have faced electric car makers is the big gear reduction necessary between the fast running motor and the road wheels. In the new apparatus this is cut in two by the simple notion of allowing both parts of the motor to revolve, the armature in one direction and the field magnets in the opposite. This gives a shaft speed for armature or fields of 1,500 r.p.m. when the *relative* speed of fields and armature is 3,000 revolutions. In the complete axle design the motor is located centrally but its axis is not in line with the tubular drive shafts that carry the road wheels; it is parallel thereto but about an inch above them. On the end on one driveshaft there is an internally toothed ring and meshing with this is a pinion on the armature shaft, but on the other side, the field magnets carry the ring gear and the pinion is on the driveshaft. This means that rotation of armature and fields in opposite directions will cause the road wheels to revolve in the same direction, either forwards or backwards according to the direction of the current.

Since one driveshaft is in connection with the armature and the other with the fields there is no direct mechanical linkage between the shafts—no differential that is. Instead, the armature can slow down while the fields speed up or vice versa, so that a corner can be taken by slowing one member and accelerating the other, but without affecting the relative speed of armature and field.

While this arrangement eliminates certain mechanical parts and might therefore be made more cheaply than the usual motor and drive, it is claimed that greater saving is also introduced by simplification of the car frame which has no driving stresses to resist but is merely a weight carrier. Also, the controller is arranged so that the motor becomes a dynamo when running down hill and puts a small charge back into the battery, though it is not suggested that this would serve greatly to increase the radius of the vehicle, it might easily add a few per cent. to the miles obtainable from one charge.

Battery Is Obstacle to Low Price

One cannot see very clearly how this new motor construction can, of itself, serve to cheapen the car a great deal. Quantity production of electric cars will not reduce their cost as much as it reduces that of gasoline vehicles, because the most important part of an electric—the battery—is already a quantity production specialty. Given a cheap battery, or means for doubling the mileage radius obtainable from a battery of given size would immediately cut the cost, but we cannot yet cheapen the battery except by reducing the radius, and it is a debatable point whether an electric at whatever price, would sell unless its radius was at least as great as that of the present more expensive cars.

Dr. Steinmetz states the ideal price for the cheap electric to be about $750 and, in the light of the discussion at the Philadelphia electric convention last year, it is not easy to see how quantity production and this new axle alone can make this possible. It is, of course, conceivable that central station interests might finance a scheme to sell electric cars for practically no profit on first cost, and it might be a sound scheme, but had mechanical difficulties only stood in the way, we should have had the $750 electric years ago.

Standard Steel Car Eight and Six

PITTSBURGH, PA., March 23—The Standard Steel Car Co., this city, one of the largest industrial corporations in the world, has entered the automobile field with two cars, an eight at $1,735 and a six at $2,100.

The eight-cylinder model uses a Herschell-Spillman V motor, 3- by 5-inch bore and stroke, giving 28.8 S. A. E. horsepower, having a single camshaft with sixteen integral cams, three-speed selective gearbox, multiple-disk clutch with Raybestos-faced steel disks, floating rear axle in pressed steel housing and vacuum fuel feed. The car has a 121-inch wheelbase and springs are semi-elliptic front and rear, being 2 1-4 inches wide in front and 2 1-2 at the rear. Tires are 34 by 4 1-2 all around. The car is made in five- or seven-passenger form.

On the six, the bore is 4 inches and the stroke 5, or 38.4 S. A. E. horsepower, the motor used being a T-head type with the cylinders cast in threes. Wheelbase is 126 inches and tires are 36 by 4 1-2. Three-speed gearbox, vacuum fuel feed and floating rear axle are also found on this car. Springs are semi-elliptic in front, 40 by 2 1-4 inches, while in the rear they are three-quarter elliptic 53 1-2 by 2 1-4. Five-passenger body only is fitted.

F. C. Vanderhoof is manager of the automobile department which the company has organized.

Dudley Tool Co. May Build Electrics

DETROIT, MICH., March 24—An electric cabriolet designed by the Dudley Tool Co. and selling at $985 with standard equipment, has been constructed for demonstration purposes. If the new car finds favor the Dudley Tool Co. and the Menominee Electric Co., both of Menominee, Wis., will be reorganized and the Dudley company, which heretofore has made cyclecars, will devote all its attention to the construction of electrics. The car has a wheelbase of 100 inches with standard tread. The artillery wheels are 30 by 3 1-2. Bevel drive and semi-elliptic front and three-quarter elliptic rear springs are employed. The motor, which is of 1 1-2 horsepower, is made by the Menominee Electric Co. The designer is Henry Tideman, president of both companies.

TACOMA, WASH., March 23—A consignment from the East of sixty-six motor tractors has arrived here for transshipment to Vladivostock for military use by Russia.

Buick Output Sold—42,000 Cars

DETROIT, MICH., March 23—Buick dealers have been informed by the Buick Motor Co., Flint, that the entire output for 1915, that is 42,000 cars, has been disposed of and that it is impossible to increase any one's original allotment.

The 1916 Buick models will be announced in June instead of in August, as has been the custom of the company thus far. It is rumored that a production of at least 60,000 cars is being planned or 18,000 more than for the season 1915.

DETROIT, MICH., March 23—The Studebaker Corporation expects to have all its 1915 cars built and shipped by May 1. The 1916 models will probably be announced in July.

Autocar Reduces Chassis Price $200

ARDMORE, PA., March 19—The price of the Autocar delivery chassis has been reduced from $1,850 to $1,650. This is the third reduction the Autocar Co. has made since January 1,

1913. The first reduction was from $2,150 to $2,000 and then from $2,000 to $1,850. The company has 2,400 customers using from one to 280 Autocars each. Its business has increased 33 1-3 per cent.

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Pass Bill Eliminating Compensation Commission

ALBANY, N. Y., March 22—The MacDonald bill, which eliminates the Compensation Commission as a necessary factor in the payment of claims under the Workmen's Compensation law which recently went into effect, has been passed by both the Senate and the Assembly at Albany, and it is expected that it will receive the governor's signature and thus become a law.

Under the compensation law as at present in force, all payments to workmen must be made through the Compensation Commission. The MacDonald bill amends Sections 20, 25 and 26 of the law and provides that an injured workman, or in the case of death, his chief dependent, may present his claim to his employer direct instead of through the commission as heretofore necessary. It is further provided, however, that the workman may present his claim to the commission if the employer rejects it or if within 10 days after it has been presented an agreement for compensation, signed by both parties, is not made and filed with the commission.

Where such an agreement is filed, the commission is required to examine it and if it is in accordance with the law to approve it, when it becomes an award, independent of the agreement; if it should differ from the agreement the award of the commission prevails. The commission is given power to impose on the employer a penalty of not more than 10 per cent. of the award where there is unfair dealing or bad faith on the part of the employer in connection with the settlement.

Should the employer be insured either with the State Fund or with a casualty company reimbursement from either agency is provided for in the bill for any amount paid to an injured employe, or to his dependents in case of death, upon presentation of proper receipts for the money paid. As the law is at present, intentional default of payment of compensation claims on the part of an employer would entail a penalty of 50 per cent. of the entire amount of compensation; under the MacDonald bill this is reduced to 10 per cent.

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ALBANY, N. Y., March 23—The bill appropriating $425,000 for expenses of the Workmen's Compensation Commission until October 1, was signed today by Governor Whitman.

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Patentee Cannot Fix Retail Sales Price

NEW YORK CITY, March 24—The substance of a decision handed down yesterday by Judge Hand of the U. S. District Court for the southern district of New York, indicates that under the patent law the patentee has not the right to fix the price at which a patented article shall be sold at retail. This decision will be of the greatest importance to manufacturers who have dictated the ultimate price at which their patented articles must be retailed as it means that if the dealer desires he may sell the patented article at any price at which he sees fit. In arriving at his decision, Judge Hand referred to the now famous Sanatogen case, in which the patented article was sold for less than its agreed price and the courts upheld the right of the dealer to do so. The present case is a suit brought by the Victor Talking Machine to restrain R. H. Macy & Co. from selling phonographs and records at a lower price than that fixed by the Victor company. The case was tried in the U. S. District Court for the southern district of New York.

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CLEVELAND, O., March 23—In reporting the decision of Judge Clark sustaining the complaint of Wm. B. Hanlon against the Rauch & Lang Carriage Co. on the Hanlon windshield patent, THE AUTOMOBILE of March 11 stated that the National Automobile Chamber of Commerce was a co-defendant. This was an error of the correspondent, as the record shows that an effort to have the N. A. C. C. brought into the suit as a co-defendant was overruled by the court. Subsequently an independent suit by Wm. B. Hanlon against the N. A. C. C. was dismissed by the court.

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Car Registrations Transferable in N. J.

TRENTON, N. J., March 23—Under an act just passed by the New Jersey State Legislature, a car registration may not only be transferred as at present from one owner to another, for the same car, but may be transferred from one car to another by the original holder of the registration. In transferring from car to car, the applicant must pay a transfer fee of $1, and surrender the original registration card.

If the new car belongs to a higher class of horsepower than the car originally registered not only the transfer fee of $1 must be paid, but the difference between the fee paid originally and that due if the automobile be properly registered in a higher class.

Licenses will be issued on and after December 1 of year, such licenses not to be used until January 1 of the succeeding year and hereafter only the licenses of the 1 year may be used during the month of January, namely, the license of the current year.

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Hearing Held on Truck Limitations

NEW YORK CITY, March 20—The Mayor's Committee on Street Traffic and Safety of New York City, met on March 19 at the Craftsman Bldg., 6 East Thirty-ninth street, this city, for the purpose of hearing arguments for or against the limitation of size, speed, and weight of motor trucks and horse wagons.

It was shown that the limitation of the size and carrying capacity of motor trucks was directly contrary to the basic principles of progress and efficiency in that the history of transportation since before the Romans has been one of carrying larger and yet larger loads per unit at ever-increasing speed. It was brought out forcefully that the limit of 28 feet in length meant that a large portion of the horse vehicles, which, including the length of the horses and the poles, are longer than the average motor truck, would have to be discarded and the loads they carry placed on a greater number of smaller drays. Such limits, it was represented, meant the increase in the number of traffic units, with therefore enormously increased haulage cost and unbearable increase in traffic congestion; which could not but react disastrously on the welfare of business generally and on the cost of living.

The hearing was adjourned until an indeterminate date in the latter part of April.

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N. A. C. C. Fights Truck Weight Restriction

ST. CLAIRSVILLE, O., March 22—The Court of Common Pleas in this city, having upheld the Mayor of Belmont in fining Roy Lake $200 for driving his truck through Belmont, the case is to be brought before a higher court by the Adams Bros. Contracting Co., Zanesville. The Adams Company is the employer of Lake, and the specific ordinance of Belmont that he violated is one limiting to 10,000 pounds the combined weight of trucks and load that may be driven over the Belmont streets. The National Automobile Chamber of Commerce is co-operating with the Adams company in fighting the case, it being felt, that should this local ordinance be upheld the use of motor trucks of over 2-ton capacity would be subject to restriction by any town or village that saw fit to pass prohibitory ordinances.

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COLUMBUS, O., March 19—The officials of the Ohio Automobile Assn., have served notice on the legislature that unless the bill requiring all vehicles to carry lights at night is adopted, a suit will be started to test the constitutionality of the automobile license law. It is believed that the law is unconstitutional, but automobilists generally have not raised the question. The light bill was passed by the Ohio senate but defeated by the farmer vote in the house of representatives.

The officers of the Columbus Chauffeur's Assn., with the co-operation of similar organizations in other parts of the state, have launched an action to test the constitutionality of the law licensing chauffeurs. It is claimed that the present law is discriminatory, as it compels professional chauffeurs to submit to an examination, while owners of automobiles can drive their cars without such an examination.

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Erie Suspends Proposed Ferry Increases

WASHINGTON, D. C., March 23—The recent increase in ferry rates proposed by the Erie Railroad has been suspended by the Interstate Commerce Commission for 4 months to July 23, to allow time for hearings. The proposed changes would impose a charge of 10 cents each for horses, automobiles and cattle, instead of 6 cents, as at present, and 25 cents for business wagons and trucks, horse drawn, up to 2,000 pounds, with an additional charge of 5 cents per ton and another additional charge of 5 cents for each 2 feet in length over 11 feet, instead of the existing rate of 18 cents on all trucks.

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BALTIMORE, MD., March 20—Strong and blinding headlights on motor vehicles are to go into the discard in Baltimore on July 1. An ordinance prohibiting these lights is now on its way through the City Council and is being highly commended.

Used Car Report Is Nationalized

Covers Seven of the Twelve Zones into Which U. S. Has Been Divided —Lists 145 Makes

NEW YORK CITY, March 22—The Used Car Central Market Report of the Chicago Automobile Trade Assn. has made its appearance in nationalized form; the data covers seven of the twelve zones into which the United States has been divided and it is hoped within the next 3 months to have the figures in hand for statistics covering the remaining divisions.

The page arrangement is considerably different from that of the original Chicago report. Across the top are the headings of the zone columns, beneath which are the names of the central cities in each zone. The "As Is," "Partial Overhauled," "Rebuilt" and "As Is Appraised" nomenclature is retained and means the same as in the old reports.

The prices in the case of actual sales are the averages of all the sales of a particular model in the zone in question; at the extreme right is the average price for the whole United States. To show the number of sales upon which the average is based for the whole United States certain letters, placed after the price, indicate the number of sales; they are: a, 5 and under; n, 6 to 10; u, 11 to 15; v, 16 to 20; g, 21 to 25; x, over 25. The present number includes more than 3,000 used car sales, made during the last 3 months of 1914.

In the case of 1914 cars no appraisal value is given; it was found upon investigation that less than 2 per cent. of the 1914 cars were sold as used during the third quarter of 1914, so that an appraisal on this basis would not have been fair. Dealers are advised to make such sales on the customer's account or consider each car on its own merits.

No appraisal is made on enclosed bodies because of the great variety of style and price.

Subscriptions to the list are $24 a year—for four issues—but in clubs of twelve or more, through manufacturer's organizations or otherwise, a price of $12 is made.

The latest list covers 131 makes of gasoline pleasure car and fourteen electrics. The zones which have not thus far been listed in the book are, with their central cities: 6, Atlanta; 8, St. Louis; 9, Minneapolis; 11, Dallas; 12, San Francisco.

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GRAND RAPIDS, MICH., March 22—The Michigan Automobile Owners' Assn. which was organized a few days ago has elected H. B. Webber, Ionia, as its president; P. T. Colgrove, Hastings, vice-president and H. J. Kennedy, Ionia, secretary-treasurer. The board of directors includes F. W. Blair, and H. H. Smith, Detroit; H. E. Wilson, Grand Rapids; G. E. Nichols, Ionia; B. F. Hall, Belding and P. T. Colgrove, Hastings. E. P. Whitney, Grand Rapids, has been chosen as general counsel.

The principal object of the new association is to maintain an inter-insurance exchange among bona fide automobile owners in the state of Michigan. It appears that the co-operative plan as to the automobile insurance resulted in a saving of 51 per cent. to California owners and of 44 per cent. to those members of the association in Kansas City.

Headquarters are in the Houseman building, this city. An office will however be opened soon in Detroit.

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DETROIT, MICH., March 23—One hundred and twenty Michigan Studebaker dealers met at a convention at the plant of the Studebaker Corp., this city, last Friday, the object being to enable as many of the state dealers as possible to get acquainted with each other. Sales manager E. R. Benson presided and the Studebaker sales policy and business details were discussed; suggestions were made as to what can be done to improve business and give more service. Following the convention the dealers were tendered a banquet at the Tuller. The opinion was practically unanimous that business is better in all territories than at any time during the last few years and that the future outlook is most encouraging.

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BUFFALO, N. Y., March 22—At the annual meeting of the Automobile Dealers' Assn. of New York State which was held in Buffalo, N. Y., on March 18, all of the directors were re-elected with the exception of the Director representing Rochester. No delegate for this city having been named. The directors include: R. E. Brown, Buffalo; C. D. Hakes, Albany; R. H. Johnston, New York City; G. H. Norris, Syracuse; H. L. Carpenter, Brooklyn, N. Y.; Emanuel Lascaris, New York City, and H. J. Hartwell, Troy.

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Dodge London Agency Not Closed

DETROIT, MICH., March 23—An item appearing in THE AUTOMOBILE of March 11, stated that Guy Lewin had taken the Dodge Bros. agency for London. This was incorrect as the agency for that city has not yet been closed.

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Vulcan Insurance Lowers $1,500 Car Rates

NEW YORK CITY, March 20—Reduced rates on automobile insurance have been promulgated by the Vulcan Insurance Co., this city, applying to cars selling under $1,500. Policies including theft and valuation clauses now carry a rate of 1 1-2 per cent. for new cars instead of 1 3-4; for last year's cars under $1,500 list, the rate has been cut from 2 3-4 to 2 1-4.

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TORONTO, ONT., March 20—The increasing number of automobiles in the province led the Mutual Fire Underwriter's Assn. of Ontario to discuss the insurance of them at the thirty-third annual convention.

It was decided that automobiles should not be insured for more than 1 year at two-thirds of actual value, and the premium should not be less than $1 per $100 per annum.

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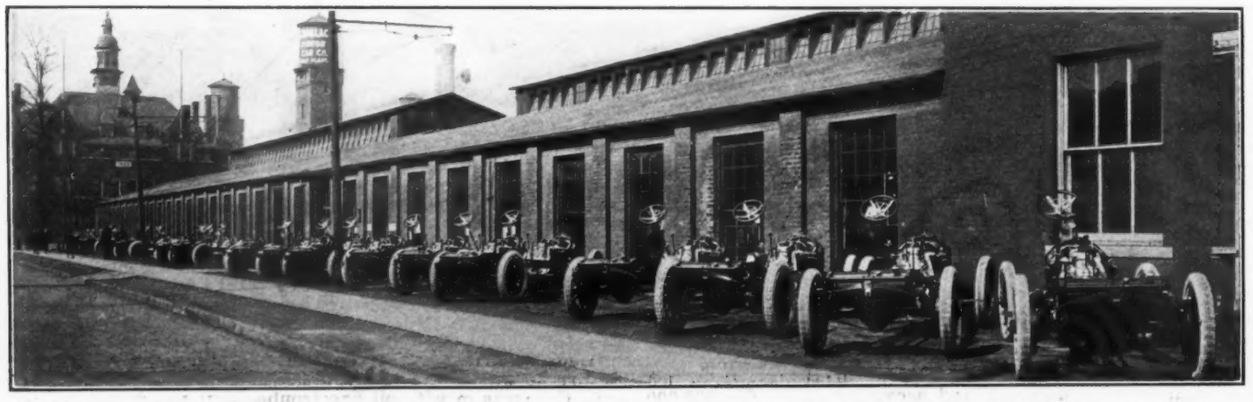
Pan-American Road Congress September 6

NEW YORK CITY, March 22—Preliminary plans were completed at a meeting in Montpelier, Vt., on March 18, for what promises to be the largest gathering of good roads advocates ever held. This meeting will be held at the Panama-Pacific International Exposition, and will be known as the Pan-American Road Congress. It will be under the joint auspices of the American Road Builders' Assn. and the American



Row of eight-cylinder Cadillac chassis ready for testing and body fitting. The company is building 100 cars a day

Highway Assn. The tentative date selected is that of the week of September 6.

The plans for the forthcoming congress will be handled by an executive committee of five. This committee is made up of Governor C. W. Gates of Vermont, chairman; W. W. Crosby, former State Highway Engineer of Maryland and E. L. Powers, Editor of *Good Roads*, representing the American Road Builders' Assn., and J. H. MacDonald, former State Highway Commissioner of Connecticut, and J. E. Pennybacker, Chief, Division of Economics, U. S. Office of Public Roads, representing the American Highway Assn.

Fiat Building Trucks for Italian Government

NEW YORK CITY, March 22—Joe Joseph, of the Fiat Automobile Co., returned on March 16 after a 5-week's visit to Italy. The Fiat factory in Turin, he reports, is producing motor trucks and other material in enormous quantities for the government, the output of motor vehicles reaching close to the 1,000-a-month mark. Such production would be impossible without the help of the Poughkeepsie factory, which is building motors, transmissions and other parts as fast as possible and shipping them to Italy for assembly.

To Build Chassis for the Trade

PONTIAC, MICH., March 22—The Pontiac Chassis Co., of Pontiac, Mich., has been incorporated under the laws of Michigan with an authorized capital of $100,000 for the manufacture of automobile chassis for the trade. Besides a number of Pontiac and Detroit capitalists the incorporators include: R. A. Palmer, Pontiac, former general manager of the Cartercar and Oakland companies; Robert Perkins, of the Massnick-Phipps Co., Detroit, and H. H. Brooks, formerly general sales manager of the Marathon Motor Works, Nashville, Tenn., and recently general sales manager and secretary of the Herff-Brooks Corp., Indianapolis, Ind.

Hans Equipment To Be Reorganized

LACROSSE, WIS., March 18—Reorganization of the Hans Motor Equipment Co. and the saving of the factory to this city are assured by an agreement entered into between Trustee D. G. MacMillan and P. M. Gelatt, and the preferred stockholders of the corporation, at a recent meeting.

As a result of the agreement the preferred stockholders will retain their interest in the plant, without investing any additional money, and the factory will continue to operate, under the management of Mr. MacMillan and Mr. Gelatt. They have acquired the interests of J. H. Hans, president, and Edmund Hans, vice-president.

Articles of incorporation of a new company are now being drafted. The National Gauge and Equipment Co. is expected to be the name decided on. The factory is now operating with 100 employees. The plant will continue to manufacture gauges and automobile appliances.

READING, PA., March 18—J. D. Esterly has been appointed a receiver for the Oakbrook Motor Mfg. Co., this city. This company manufactures cyclecar motors. W. F. Young, the plaintiff, is a stockholder of the company and a creditor to the extent of $9,849. The action has been taken to preserve the assets for the benefit of the creditors.

NEW YORK CITY, March 22—John L. Poole, European sales manager of the Hupp Motor Car Co., Detroit, Mich., with headquarters in Paris, France, reports that he has sold over 100 cars per month since October, 1914, which is under his regular trade, and not included in his war orders.

Columbus Track Races May 15

COLUMBUS, O., March 22—The dates for the Columbus race meeting has been definitely fixed at May 15 and 16 by the contest committee of the Columbus Automobile Club of which C. C. Janes is chairman. The program for the 2 days will consist of 5, 10, 15, 25, 50 and 100-mile races. It has been decided not to hold a 200-mile race as in former years.

NEW YORK CITY, March 23—Everard Thompson, Graduate Manager of the Yale Ticket Bureau, will resign to become manager of the Sheepshead Bay motordrome. He will also take charge of the construction work of the arena, which will include a 2-mile track and accommodations for 200,000 spectators with seats for half that many.

Plan $50,000 Exposition Road Race

Grand American Sweepstakes To Be Held in October—No Piston Displacement Limit

CHICAGO, March 22—Encouraged by the attendance at the Grand Prize and Vanderbilt Cup races of 1915, officials of the Panama-Pacific exposition are planning to promote a third road race on the exposition course in October and in order to attract the star drivers of this country and Europe, will hang up a purse of $50,000, the largest ever offered for a road race.

This was the announcement brought from San Francisco to Chicago by A. J. Hill, manager of the Peugeot Auto Import Co. of New York City, who accompanied Dario Resta, winner of the Grand Prize and Vanderbilt cup, from the Pacific coast and stopped over in this city Saturday when he and the triumphant Italian were guests of honor at a luncheon given at the Chicago Automobile Club by Edward Duffield, Chicago manager of the Thermoid Rubber Co.

The $50,000 fall race will be called the Grand American Sweepstakes and will be open to the cars and drivers of the world. No piston displacement limit will be placed on the entries and much the same rules will apply as now prevail in the grand prize. William L. Hughson, chairman of the racing board of the exposition, plans to come to Indianapolis for the 500-mile race in order to induce the foreign drivers to remain in this company for the Exposition contest.

If the exposition authorities decide to hold such a race the course will be improved.

Oldfield and Carlson Win at Tucson

TUCSON, ARIZ., March 20.—Following up their victory in the Venice race a few days before, the veteran Barney Oldfield, and his team mate Billy Carlson, both in Maxwells, finished one, two in the 100-mile road race staged in Tucson, Ariz., on Saturday, March 20. Oldfield averaged better than 67 miles an hour over a dusty 4-mile desert course and Oldfield made no stops. He used Firestone tires. R. H. Delano's Moon was third. Nine cars started.

Only 30 Stops in Venice Race

VENICE, CAL., March 24—A non-stop record was established last week by Barney Oldfield, winner of the 300-mile Venice race, when he succeeded in going through the race without having gone to the pits once nor having stopped on any part of the course. He also drove throughout the race without shifting a gear. His Maxwell was equipped with Bosch magneto, Rajah plugs, Master carbureter, Firestone tires, Oilzum, Houk wheels and Boyce motometer.

During the entire race there were but thirty stops made at the pits. Oldfield's pit was the only one that was not visited during the day.

Rickenbacher's only stop was the one that cost him his place in the race.

Carlson made but one stop and in less than 10 seconds had filled up with oil and gas.

Ruckstell's 16-minute stop was the longest of any during the day.

Most of the stops were just for water and oil although Durant in the Chevrolet was called in with a broken rocker arm once. Le Cain stopped once to take on water before he went out in the fifth lap with a broken radiator, making three stops in all.

Grant made a stop in the eleventh lap to change a set of spark plugs and he was an unfortunate from that moment.

Cadwell made a number of visits to his pit during the time that he was in the race and Disbrow was in three times.

Lewis stopped for oil and gas on his fiftieth lap, his only stop in ninety-six rounds. The Parsons Special stopped in the twenty-fifth and again in the sixty-sixth, the lap before he went out. The first stop was to take on oil and the second was for a motor adjustment.

Eddie Hearne in the Case went half way through the race before he was forced to stop at the pits. He took on oil and gas, then was in with oil line trouble later which was responsible for his losing the race.

New Jitney Buses

Studebaker, Koehler and Kissel Special Vehicles of This Type

Exterior and interior views of the new Studebaker jitney bus

STUDEBAKER has recognized the importance of the jitney bus movement, and to meet the demand for a vehicle specially designed for the service has added a Transportation Model, so called, to its line. Mechanically it adheres to standard Studebaker practice, but to care for the increased loads is more strongly built, the rear construction in particular being designed for heavier work than usual.

Fourteen passengers can be seated comfortably in the body of this car. Entrance and exit are by the front door only, which is on the right side and is controlled by an opening and closing lever in front of the driver who sits on the left. Standard center control is used.

The body is carried on sills placed both lengthwise and crosswise of the chassis. There is only a 16-inch step-up to the floor. A sanitary floor of wooden grids covers the floor of the body. All seats are leather upholstered. They are 16 inches deep and the backs are 18 inches high. The body is 60 inches in inside width, which gives ample knee room for all passengers.

Electric dome lights give a brilliant illumination at night and the windows may be removed in pleasant weather. The driver's window is clear vision, rain vision, and ventilating.

The standard Studebaker four motor of 3 1-2-inch bore and 5 inch stroke is used. The Studebaker-Wagner electrical system, the Willard storage battery, the Remy ignition and the Studebaker carbureter are the chief motor accessories.

A 25-gallon gasoline tank is carried in the rear, and feeds to the carbureter through the Stewart vacuum system.

The wheelbase is 116 inches which is 8 inches longer than the Studebaker delivery car. The pressed steel frame is 5 inch channel section. Large Timken bearings are used throughout the chassis. The gear ratio is 4.6 to 1.

Tires are Goodrich 35 by 5 with a spare on the side. The bus sells for $1,235 complete. It is finished in an olive green with red wheels.

Above—The new jitney bus built by H. J. Koehler & Co., Newark, N. J., which has been placed in service in that city. This is mounted on the Koehler truck chassis and is a pay-as-you-enter design. The distance between ends of the run is 3.3 miles, and it is figured that a paying basis is reached with fifteen passengers per trip

Right—Kissel jitney bus used by the students of Compton Union High School, Compton, Cal. This is an excellent example of the carrying power of machines of this type

Developments in the Jitney Bus Field

COLUMBUS, O., March 19—The jitney bus idea is still rapidly developing in the state of Ohio. It first appeared in the larger cities, but later on smaller municipalities and even towns and villages are enjoying bus service. One of the features is the fact that bus lines are being established between cities and suburbs or surrounding towns. This is being done often in competition with traction lines. Everywhere the jitney bus is a thorn in the side of the street car lines. Steps are being taken by the officials of several of the traction systems to combat the jitneys, but so far their efforts have not been very successful.

In many cases the fare is higher than a nickel, although the nomenclature of the jitney bus still clings to the movement. The higher price is readily paid by passengers who prefer the bus to the slower and unsanitary street cars.

In Columbus the buses are meeting with better success than at the start.

Buses have made their appearance in Akron, O., with a large number of private owners. Service has been inaugurated from the down-town district to the suburbs. Many of the workers in the rubber plants are patrons.

The Ohio Electric Railway Co. is to have competition between Columbus and Reynoldsburg, a small town east of the Buckeye Capital. The Reynoldsburg Transportation Co. has been chartered under Ohio laws and an hourly service both ways will be established at once.

Reports from Lima, O., show that the truck factories in that place have been compelled to turn down orders for jitney buses. This is due to the large number of orders which are on the books of the companies. Orders for 100 buses from Boston and fifty buses from New Orleans were turned down.

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Milwaukee Jitney Operators Organize

MILWAUKEE, WIS., March 13—In the short space of 1 month, Milwaukee's jitney bus industry has grown to comparatively large proportions and hardly a day passes without the issue of at least one license to operate a bus. The jitney bus owners have already formed an association for mutual benefit and is even now planning a system of transfers or interchange of passengers.

On March 15 the city of Milwaukee had issued licenses to fifty-seven owners of cars for purely jitney service. The license costs $10 annually and is the same that covers taxicab and other car-for-hire operation. At this time licenses are granted for $5 for the short term, all grants expiring July 1.

About 50 per cent. of the jitneys in operation in Milwaukee are Fords. The list of machines shows nearly forty different makes, among them two Wintons, two Locomobiles, two Mitchells, three Ramblers and other makes of considerably higher power and more weight than the Ford. Several Ford jitney operators claim to average a gross revenue of $25 per day of 12 hours.

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CONCORD, MASS., March 20—New England appears to be adopting the jitney bus gradually, but surely. Lines are operating in Portland, Me., and a company has been organized in Providence, R. I., which will begin operating a system of automobile coach lines in April. The cars will each seat twenty-one persons. Independent cars to the number of 200 are already licensed to run in the streets of Providence.

In Boston several buses have for some time been run between the Commonwealth Fish Pier, South Boston, and the foot of State street, on Atlantic avenue. The district about the pier has no convenient electric service. There are two Velie buses, of the front entrance, prepayment type, each accommodating eighteen persons. Trips are made on a 20 minute schedule, the distance being about a mile. The fare is 5 cents and the running time 7 minutes. As many as 400 passengers a day per car have been carried. Besides the two Velies, there are three Autocars, each accommodating eight to twelve passengers.

At Lynn, Mass., five large motor buses are in regular operation on fixed routes, each one paralleling street car lines. There are three nineteen-seat Federal cars, a sixteen-seat Autocar, and a nineteen-seat Universal. All the vehicles are operated individually, each by its owner.

One operator reports that 3,000 passengers a week is about the average number of fares of each of the vehicles. The daily run in each case is about 90 miles.

Besides the cities mentioned, automobile buses are also operated between Greenfield and Turner's Falls, Mass. Here their route does not parallel the street car line.

Another successful line is being operated between Salem and Peabody, Mass. Here two cars make a circuit, every trip in the opposite direction from the last.

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Claims Minimum Daily Profits of $4

DES MOINES, IA., March 22—Replying to the Des Moines City Railway Co. and other interests which have predicted that the jitney bus will prove a failure in Des Moines, G. A. Fosdick, a local jitneer, has made a statement to the press which is in part as follows:

"I have an Oakland five-passenger car, 1911 Model 30, for which I took out a city taxi license, and have been operating as a jitney 27 days. I have driven about 3,000 miles and have taken in $270.70, or a fraction over $10 a day, mostly in nickels, with a few 25-cent, 50-cent, and $1 special drives mixed in. I use about $1.25 worth of oil and gasoline per day and figure $2 a day for tires. The other expense, such as accidents and repairs, are hard to figure for a short period, but if I allow myself wages of $4 per day, I would have left $2.75 per day or $860.75 for the 313 working days in the year for repairs and deterioration."

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FINDLAY, O., March 22—Nearly every town and city in Northwestern Ohio has its jitney buses now, and all of them appear to be making good. Among the big propositions in this direction is a jitney line between Tiffin, Fremont and Port Clinton. Motor trucks carrying fifteen people and a 2-hour service between the places has been planned.

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DANVILLE, ILL., March 22—Four jitney bus routes are now in operation in Danville, Barkman and Gast, operating the Lincoln park line report a haul of 400 passengers daily, considerably above operating expenses.

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Jitney Buses Thrive in Baltimore

BALTIMORE, MD., March 20—Women in the jitney bus business seems to be the growing fad in Baltimore. Another has entered the field and she plans to give transfers from one of her lines to another in the near future. At present, however, she has started only three cars, all running from South Baltimore to the business section of the city. The woman who has entered the business is Mrs. A. M. George, and she is at the head of the Auto-Coach Co.

Three new jitney lines were placed in operation this morning and one of these will be the first to run cars on Sunday. It will begin tomorrow. Hardly a day passes that the putting into operation of new lines is not witnessed. All the lines seem to be doing a thriving business.

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VENICE, CAL., March 18—The Venice chief of police, acting under orders from the city trustees, has notified jitney bus drivers that they could no longer operate between Los Angeles and Venice, as no permits would be granted for jitney bus service within the city limits of the beach resort. More than seventy-five machines will be put out of the service by the ruling. The Venice city council met March 8 and adopted an ordinance fixing a $100 license fee for passenger-carrying machines of the jitney bus class. It left the issuing of such licenses to the city trustees and today the trustees decided to issue no licenses.

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TACOMA, WASH., March 18—The Washington State legislature has passed a bill over the Governor's veto compelling each jitney driver to put up $2,500 surety bonds. Jitney bus drivers in this city will join organizations in Seattle to obtain a vote by the people against the bill.

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Velie Ships 12 Jitneys to Coast

MOLINE, ILL., March 19—The Velie Motor Vehicle Co. shipped twelve twenty-passenger cars to San Diego, Cal., this week for jitney bus service. These cars have the lines and appearance of very large automobiles and do not resemble the ordinary sight-seeing bus of the large cities. A row of lights is recessed in the sides of each body.

Factory Miscellany

REPUBLIC Truck to Enlarge—The business of the Republic Motor Truck Co., Alma, Mich., is keeping on increasing in such a way that the enlargement of the plant will most likely be necessary within a short time. During the week ending March 6 a total of forty-two orders for trucks were received and during the week ending March 13 thirty trucks were built and shipped. This month's business, it is estimated, will total more than $150,000.

Dile to Build—The Dile Motor Co., Reading, Pa., contemplates building a $50,000 plant at Lititz, Pa.

New Plant for Rockton—The U. S. Wheel & Tire Co. expects to break ground for its new factory at Rockton, Ill., not later than March 1.

Judson Adds—The Judson Motor Car Co. has let a contract for a one-story brick and steel addition to its factory building at Detroit, Mich.

Kellogg Pump at Full Capacity—The Kellogg Mfg. Co., Rochester, N. Y., which makes the No. 101 all-metal engine-driven tire pump, is working day and night.

To Mfr. Valves—Automobile valves will be manufactured by Harry Brown, who has leased 6,000 square feet of floor space at 48 Twenty-fourth street, Detroit, Mich.

Johnstown Rubber Moves—The Johnstown Rubber Co., Johnstown, Pa., will move its plant to Lacolle, Westmoreland County, Pa., where a new factory, 100 by 200 feet, will be erected.

Mullins Co. Purchases Land—The W. H. Mullins Co., manufacturer of automobile parts and bodies, has purchased a lot north of the present plant in Salem, O., upon which a large addition to the plant will be erected

Grant Using Tent—The Grant Motor Co., Findlay, O., has erected a large tent in its south plant premises, where it is assembling its six-cylinder cars. The company is away behind with its orders and is doing this to facilitate matters.

Manufacturing Portable Garages—The Portable Garage & Construction Co., Columbus, O., incorporated recently with a capital of $5,000, has started to manufacture portable all-steel garages for private use. B. H. Thompson is at the head of the company.

Kentucky Battery Co. Equipping—The Kentucky Revivo Battery Co., Louisville, Ky., which manufactures what is said to be a rechargeable dry storage battery, is equipping its factory in the large building at Ninth and Jefferson streets for a capacity of $1,000 worth of batteries per day.

Jeffery Running Full Time—The factory of the Thomas B. Jeffery Co., Kenosha, Wis., is running three 8-hour shifts per day, and the output of trucks and pleasure cars it is expected will reach forty-five per day by the first of April. The daily shipments now average twenty pleasure cars and twenty trucks.

Schendel Makes Change—W. A. Schendel, assistant purchasing agent of the A. O. Smith Co., Milwaukee, Wis., motor trucks, pressed steel frames, parts, etc., has resigned to accept the post of purchasing agent for the A. J. Lindemann-Hoverson Co., Milwaukee, a large sheet metal working interest.

The Automobile Calendar

Mar. 22-27	Bangor, Me., Show, Bangor Auditorium.
Mar. 22-27	Newark, O., Show, Arcade Bldg.
Mar. 24-27	Oil City, Pa., Show, New Armory.
Mar. 25-27	Mason City, Ia., Show, New Armory.
Mar. 30-April 2	Johnstown, Pa., Show, The Auditorium.
April	Calumet, Mich., Show, Coliseum.
April 3	Paterson, N. J., Show, Auditorium, R. A. Mitchell.
April 4	Los Angeles, Cal., Track Race.
April 5-10	DuBois, Pa., Show, Moose Hall.
April 7-10	Calumet, Mich., Show, Coliseum Rink.
April 16	Manchester, Eng., Show, Ice Palace, North of England Motor Shows, Ltd.
April 20-22	Oklahoma City, Okla. Road Race, S. W. Auto Racing Assn.
May 15-16	Columbus, O., Track Race, Columbus Automobile Club.
May 17-18	Boston, Mass., A. A. A. Annual Meeting.
May 27	Chicago, Ill., Sociability Run of Chicago Motor Club to South Bend, Ind. H. H. Robinson.
May 29	Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 9	Galesburg, Ill., 200-Mile Race, Galesburg District Fair Assn.
June 19	Chicago, Ill., 500-Mile Race, Chicago Speedway.
July 3	Sioux City, Ia., 300-Mile Race, Sioux City Speedway Assn.
July 4-5	Tacoma, Wash., Road Race.
July 5	Omaha, Neb., Speedway Races, Omaha Motor Speedway.
Aug.	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21	Elgin, Ill., Road Race.
Sept.	Indianapolis, Ind., Fall Show, Indiana State Fair.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.

Drednot Truck Enlarges—The Drednot Motor Truck Co., of Montreal, Que., Ltd., has acquired additional premises and the same are being remodeled for the installation of more machinery as rapidly as possible. The building adjoins the present factory and will afford floor space to the extent of 20,000 square feet.

Hupp Spending $150,000 on Additions—The Hupp Motor Car Co., Detroit, Mich., is spending $150,000 for additions to its plant, including a two-story office building, 1,800 by 300 feet; a top and body building, 1,500 by 300 feet; a testing laboratory, 350 by 200 feet, and an engineering building, 200 by 200 feet.

Roberts Plant to Be Reopened—The plant of the defunct Roberts Motor Co., Sandusky, O., will be in operation in the near future. Purchased recently by F. P. Zollinger, trustee for the creditors, it will be turned over to a new company, of which W. H. Burke, president of the old company, is temporarily at the head.

To Mfr. Carbureters—The Bright Mfg. Co., 204 Castle Hall Bldg., Indianapolis, Ind., is being organized with a capital stock of $75,000 to manufacture carbureters and other patented accessories for automobiles. It will be in the market for a complete brass foundry equipment and machinery. J. R. Crawford is general manager.

Want Criter Carbureter Plant—Efforts are being made by Lima, O., to secure the plant of the Criter Carbureter Co., which has been incorporated recently with a capital of $50,000 by Hamilton (O.) capitalists. The device is the invention of V. C. Criter. Hamilton officials are also trying to secure the location of the plant in that city.

Fire in York Plant—Fire destroyed a portion of the plant of the York Wagon Gear Co., North Belvidere avenue and the Western Maryland Railway, York, Pa., engaged in the manufacture of wagon and automobile bodies, recently, entailing a loss of $10,000. The fire originated in the drafting room and many valuable patterns were destroyed.

Moon Makes Factory Changes—Many factory changes have been made by the Moon Motor Car Co., St. Louis, Mo., because of the increase of business. The company has had new switches laid connecting its yards with the tracks of two railroads and has enlarged its enameling ovens. Hereafter an entire floor will be devoted exclusively to painting and varnishing.

Canadian Ford's Garage Output—All previous records for continuous output of Ford cars are being broken this month by the Ford Motor Co. of Canada, Ltd., Ford, Ont., an average of about 115 cars per day being maintained so far. During the first week in March nearly 600 Ford cars were turned out, and within the next few days it is expected to reach an additional 10 cars per day.

To Make Tires in Elyria—A site has been selected by the officials of the Elyria Tire & Rubber Co., Elyria, O., for a factory, to be located at Elyria. The incorporators of the new concern have been connected with the Firestone company, of Akron, and have considerable experience in building and marketing tires. It is the intention to make solid tires at first, but later to make pneumatic tires. A total of $50,000 will be used to install the machinery.

Youngstown Co. Adds—The erection of a battery of coke ovens capable of producing 50,000 tons monthly and finishing mills capable of turning out 25 tons in a 30-day period is planned by the Youngstown Sheet & Tube Co., Youngstown, O. Construction of coke ovens has been positively decided upon while the finishing mills may be either additional sheet mills, merchandise mills, jobbing mills, or tin plate mills, as conditions seem to warrant later. An outlay of more than $6,000,000 will be required to carry through the plan.

The Week in the Industry

Motor Men in New Roles

FUESSLE Chalmers Advertising Mgr.—N. A. Fuessle has been appointed advertising manager of the Chalmers Motor Co., Detroit, Mich., taking the place of Lee Anderson, who is now in a like capacity with the Hupp Motor Car Co. Mr. Fuessle comes from the advertising department of the Packard Motor Car Co., where he was during the last 6 months. Previous to that he has been during many years a magazine writer in Cleveland, contributing to publications like "Collier's," "Everybody's," etc.

Spear Scripps-Booth Mgr.—R. H. Spear has been appointed general manager of the Scripps-Booth Co., Detroit, Mich.

Lurie Heads Singer Dept.—Robert Lurie is now in charge of the used-car department of the Singer Motor Co., New York City.

Harrington Joins Fuller—F. C. Harrington has taken charge of the truck department of the Alvan T. Fuller Co., Boston, Mass., agent for Packards.

Wagner Detroiter Secretary—E. H. Wagner has become secretary-treasurer of the E. M. Owens Sales Co., Indianapoils, distributor for the Detroiter.

Chilman Detroit Regal Mgr.—W. L. Chilman has been appointed manager of the Detroit (Mich.) branch of the Regal Motor Car Co., at 758 Woodward avenue.

Armstrong Makes Change—J. A. Armstrong, who was in charge of the offices of S. F. Bowser & Co., Detroit, Mich., automobile gasoline tank manufacturers, has joined the Cutting & Smith Sales Co.

Mabley Joins S. K. F. Co.—C. R. Mabley, for the past 5 years general manager of the R. I. V. Ball-Bearing Co., has joined the selling organization of the S. K. F. Ball-Bearing Co., New York City.

Loechler Standard Mgr.—H. F. Loechler, formerly connected with the Ohio Electric Co., Columbus, O., has been made manager of the electric department of the Standard Motor Car Co., Columbus.

Hewitt with Four-Wheel Drive—G. P. Hewitt, of Appleton, Wis., formerly with the Buick agency there, has been appointed manager of the sales department for the Four-Wheel Drive Auto Co., Clintonville, Wis.

Feltz White Service Mgr.—C. E. Feltz, connected with the automobile business in St. Louis, Mo., for the past 10 years, has been appointed manager of the service department of the local White establishment.

Desautels Heads Detroit Hammond Branch—The Detroit (Mich.) branch of the Hammond Steel & Forging Co., Inc., Syracuse, N. Y., is located at 1613 Dime Savings Bank Bldg., with George Desautels as manager.

Aldrich Promoted—A. L. Aldrich, second vice-president of the Shaw Motor Co., organized at Chicago several years ago, and now permanently located in its new works at Sauk City, Wis., has been promoted to first vice-president.

Komp Heads Lansden—F. S. Komp, formerly manager of the Lehigh Valley Structural Steel Co., has gone to Brooklyn, N. Y., where he is the head of the Lansden Automobile Co., manufacturer of electrically propelled vehicles.

Potter Gets Dodge Appointment—Dodge Bros., Detroit, Mich., have appointed A. M. Potter as manager of claims of their service department. Mr. Potter was formerly manager of the service department of the Lozier Motor Co.

Wilkening Makes a Change—F. W. Wilkening, for some years manager of the Boston branch of the Motor Parts Co., has been transferred to Philadelphia to take charge of the branch there, and his brother has been put in charge at Boston.

Harper Burlington Brass Mgr.—George Harper, Chicago, Ill., has been appointed superintendent and general manager of the Burlintgon Brass Works, Burlington, Wis., to succeed W. B. Crawford, who resigned to return to Eastern connections in a like line.

Woodwin District Sales Mgr.—T. C. Woodwin, formerly of Detroit, Mich., has been appointed district sales manager for the states of Kansas, Missouri and Nebraska by the Lewis Spring & Axle Co. He will have his headquarters in Kansas City, Mo.

Slater Resigns—W. J. Slater has resigned his position as assistant sales and advertising manager of the motor car department of the Durant-Dort Carriage Co., Flint, Mich., to join the sales organization of the Firestone Tire & Rubber Co., Akron, O.

Jones Pyrene Mgr.—A. C. Jones, formerly manager of the Dayton (O.) branch of the Pyrene Mfg. Co., has been appointed manager for the company in Indiana and has opened a sales and distributing branch at 345 North Capitol avenue, Indianapolis.

Howard Louisville White Mgr.—The White Co., Cleveland, O., has established a branch at 728 South Fourth street, Louisville, Ky., with G. M. Howard, district manager of Kentucky and southern Indiana territory, in charge. The Van Patton Motor Car Co. has acquired the agency.

Dasey in Detroit—Offices have been opened in the Kerr Bldg., Fort and Beaubien streets, Detroit, Mich., by P. J. Dasey, who is now in charge of the sales department of the Michigan Crown Fender Co., of Ypsilanti, Mich. Mr. Dasey was formerly sales manager of the George W. Hook Co., Buffalo, N. Y.

Sackett with Cadillac Again—L. S. Sackett, at one time with the Cadillac in Boston, Mass., and later manager of a branch in Providence, has returned to Boston to join the sales force of the company again. The service, stock and accounting departments of the Cadillac agency have been moved to 79 Brookline avenue.

Smith Heads Airplex Tire—A. F. Smith has been named president of the Airplex Inner Tire Co., St. Louis, Mo., which has established a plant at 312 Pearl street, that city. R. D. S. Bennett was named vice-president and Arthur Ralston, secretary-treasurer. These officers and J. M. Wilkerson and R. M. Lowe will constitute the board of directors. The capital will be increased from $3,000 to $20,000.

Henne Columbiana Tire Mgr.—The Columbiana Tire & Rubber Co., Columbiana, O., has secured W. C. Henne, formerly sales manager of the Mansfield Tire & Rubber Co., as general manager of the new plant. The Columbiana company was recently incorporated for $300,000 to manufacture automobile tires and other rubber articles. W. C. Henne, G. W. Henne, W. F. Henne, J. C. Henne and Charles Hoffman are the incorporators.

Austin Studebaker Superintendent—W. W. Austin, who has been superintendent of service, parts, machine and experimental work in Detroit, has been made general superintendent of the Studebaker South Bend Works, South Bend, Ind. W. R. Cavanaugh, who has been in charge of methods department of the Studebaker corporation, Detroit, has been appointed assistant general superintendent of the Studebaker works in South Bend.

Burgess Heads Dorris Sales—W. L. Burgess, formerly manager of the rim department of the Firestone Tire & Rubber Co., Akron, O., and later sales manager of the Enger Motor Car Co., Cincinnati, O., has joined the Dorris Motor Car Co., St. Louis, Mo., taking entire charge of sales. The Dorris line includes four-cylinder and six-cylinder pleasure car models, a 1,500-pound delivery wagon and a 2-ton truck, and an extensive selling campaign will be initiated at an early date.

Dr. Taylor Heads Ford Hospital—For the purpose of gathering data for use in the organization and operation of the Henry Ford Hospital, which the automobile maker will establish in Detroit, Dr. J. N. E. Taylor, who will head the new institution, Dr. Frank J. Sladen and E. G. Leibold, Mr. Ford's private secretary, spent a large part of Monday in going over Johns Hopkins Hospital, Baltimore, Md. They gathered much information while there. Dr. Sladen is a graduate of Johns Hopkins.

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Garage and Dealers' Field

Rex Tire in Philadelphia—A newcomer, the Rex Tire & Rubber Co., Philadelphia, Pa., featuring the Blackstone non-slip tire, has opened salesrooms at 304-306 North Fifteenth street, under the supervision of I. B. Humphreys.

Orange Chevrolet Moves—The Motor Sales agency of the Oranges, East Orange, N. J., agent for Ford and Chevrolet cars, has moved to a new sales and service building at Main and Clinton streets. H. F. Herdman is manager.

Agent Adds Another Tire—The Costello-Lang Co., San Francisco, Cal., Pacific Coast distributor of the Hardman Sure-Grip tires, have opened for business and have also received the Pacific Coast agency for the Cross-Grain tube and the Falls tire.

Recent Incorporations in the Automobile Field

Ohio

CINCINNATI—Heeb Automobile Service Co.; to Packard Auto Service Co.

CINCINNATI—Ideal Service Co.; $25,000; dealer. E. M. Henderson, A. Krippendorg, J. E. C. Kohlsatt, S. B. Sutphin, E. M. Reinhart.

CINCINNATI—Numatic Co.; $15,000; to manufacture and deal in tires. O. H. Fester, Robert Franken, Frederick Havekotte, F. L. Richard, P. W. Weber.

CLEVELAND—Adams-Oakland Co.; $55,000; automobile dealer. H. M. Adams, A. A. Sterns, J. C. Royan, J. A. Chamberlain, L. A. Krauss.

CLEVELAND—Allbaugh Motor Sales Co.; $10,000; dealer. J. W. Allbaugh, C. S. Allbaugh, T. K. Allbaugh, W. A. Allbaugh, B. K. Allbaugh.

CLEVELAND—Auburn Sales Co.; $15,000; dealer. P. R. Ward, E. C. White, E. E. Deem, E. H. Clay, W. P. Street.

CLEVELAND—Clouse Tire Repair School Co.; $2,500; to teach tire repairing. J. A. Burke, C. A. Burke, F. F. McFadden, R. M. Schrod, E. C. Spades.

CLEVELAND—F. J. Erney Mfg. Co.; $3,000; automobile signal lamps. J. H. Pavolik, Jr., A. J. Kasch, J. F. Pavolik, F. J. Erney, A. A. Lutton.

CLEVELAND—Gholson Auto Co.; $10,000; dealer. K. M. Gholson, W. F. Gholson, A. N. Meyer, Esther Hayes, J. G. Murphy.

CLEVELAND—Gutman Tractor Co.; $10,000; manufacturer. E. K. Hoy, L. M. Henges, B. A. Shatto, M. J. Kurka, O. D. Eshalman.

CLEVELAND—Robs-Bennhoff Wagon and Auto Co.; $5,000; dealer. J. W. Bennhoff, E. H. Robs, C. T. Rose, W. N. Hoppensack, J. A. Fogle.

COLUMBUS—Hub Motor Truck Co.; $300,000; manufacturer. J. B. Baas, J. C. Chester, T. C. Hanly, J. L. Herpich.

COLUMBUS—Kissel Service Co.; $10,000; dealer. C. G. McCune, R. T. Fisher, William Gaither, J. M. Garard, L. B. Dunning.

DAYTON—Bates Motor Car Co.; $10,000; dealer. O. E. Bates, E. G. Bates, C. E. Bates, A. M. Bebhart, J. C. Schneffer.

DEFIANCE—Elliott-Markey Co.; $10,000; dealer. G. W. Elliott, J. C. Markey, H. L. Elliott, R. E. Markey, B. J. Emery.

DEFIANCE—McCleary Garage Co.; $20,000; garage. A. C. McCleary, D. W. Cook, D. A. Baker, W. J. Miller, E. R. Mallett.

LOGAN—Main Motor Car Co.; $25,000; dealer. T. C. Johnson, A. H. Johnson, Flora Spohn, F. A. Koppe, L. K. Kienle.

SIDNEY—Sidney Auto Sales and Supply Co.; $20,000; dealer. W. H. Persinger, W. L. Allton, B. H. Mires, J. D. Barnes.

TOLEDO—H. P. Dodge Engineering Co.; $10,000; dealer in batteries. H. P. Dodge, N. A. Whitney, M. S. Dodd, F. C. Averill, G. F. King.

TOLEDO—Toledo Central Garage Co.; $10,000. I. O. Denman, G. S. Lemman, Gustave Oblinger, D. P. Smith, Rosamond Fuller.

WILLOUGHBY—Standard Fuel Oil Co.; $50,000; engine manufacturer. J. E. Morley, C. H. Gale, H. C. Jones, B. A. Kittinger, W. T. Kinder.

YOUNGSTOWN—Motor Sales and Supply Co.; $10,000; dealer. W. V. Burnett, D. L. Rose, A. C. Hendry, D. F. Griffith, R. C. Fuhrman.

Oklahoma

MUSKOGEE—Muskogee Automobile Dealers Assn.; mutual capital stock. W. A. Campbell, C. L. Anderson, Harry Kitto, Henry Waterston, S. J. Miller.

OKLAHOMA CITY—Elerick Jitney Auto Co.; $25,000. C. F. Elerick, A. M. Elerick, L. C. Palmer.

SAPULPA—Sapulpa Gasoline and Oil Co.; $15,000; dealer. P. E. Smith, L. E. Smith, P. F. Smith.

TULSA—Auto Repair & Mfg. Co.; $10,000. L. F. Barnes, M. O. Randall, M. A. Campbell.

WAKITA—Clinesmith Motor Co.; $5,000. F. L. Clinesmith, John Clinesmith, William Clinesmith.

Oregon

PORTLAND—Portland & Suburban Auto Transit Co.; $200,000; jitney bus line. F. L. Waller, W. P. Andrus, E. W. Morgan.

Pennsylvania

ALLENTOWN—Great Eastern Rubber Co.; $100,000; manufacturer tires. C. R. Fluck, D. M. Knabb, V. A. Nagle.

PHILADELPHIA — Olewine's Garage; $50,000; to maintain storage houses and garages. F. R. Hanssell, G. Purnell, S. C. Seymour.

Tennessee

CHATTANOOGA—Spring City Auto Co.; $1,000; dealer. J. D. Carlin, G. W. Stephenson, J. M. Adams, O. P. Darwin, C. C. Moore.

Texas

EL PASO—Motor Bus Co.; $2,500; operator line of motor buses. J. V. Robins, J. J. McCourt, J. W. Kirkpatrick.

HOUSTON—Magnolia Motor Sales Corp.; $12,000; dealer. J. D. Herr, P. H. Carr, G. E. Gilmore.

NACOGDOCHES—Schmidt Auto Sales Co. and Garage; $15,000. H. J. Schmidt, Albert Bright, John Schmidt.

Virginia

PULASKI—Pulaski Motor Car Co., Inc.; $25,000; dealer. J. W. Eckman, H. L. Trolinger, R. R. Moore, W. H. Trollinger, F. J. Laughon, H. W. Steger

West Virginia

CLARKSBURG—Motor Ignition & Devices Co., $400,000; ignition systems. E. R. Diehm, Ernest Angell, C. C. Owens, W. D. Fleming, H. T. Clark.

WHEELING—Jitney Transportation Co.; $5,000. Jos. Weiskircher, Chas. Weiskircher, E. Weiskircher.

Wisconsin

ANTIGO—Utility Steel Tractor Co.; $24,000; manufacturer tractors and trucks. S. D. Stewart, N. C. Nordin, F. A. Hecker.

APPLETON—Appleton Ford Co.; $6,000; dealer. W. C. Hull, R. A. Schwartzberg, J. L. Tollefson.

BELOIT—Rex Gasometer Co.; $35,000; manufacture measuring devices for gasoline tanks, etc. W. H. Corcoran, R. H. Goodwin, E. R. Young.

CANTON—Globe Motor Car Co.; $100,000; dealer. C. S. Lochamer, E. M. Raber, G. A. Marks, J. W. Rover, J. R. Bodine.

GRAND RAPIDS—Prentiss-Weaver Mfg. Co.; $20,000; automobile parts manufacturer. D. B. Philleo, T. A. Taylor, G. O. Babcock.

MANITOWOC—Dicke Taxicab Co.; $1,000. W. C. and L. S. Dicke and Hugo Menzel.

MILWAUKEE—Boggis-Dietz Electric Co.; $10,000; manufacturer in electrical devices. H. F. Boggis, E. L. Dietz.

MILWAUKEE—Burgett Auto Co.; changed to Milwaukee Motor Sales Co.

MILWAUKEE—Federal Rubber Mfg. Co. of Milwaukee; $2,000,000 to $3,000,000.

MILWAUKEE—Milwaukee Steel Type & Die Co.; $20,000. A. C. Moeller, F. H. Scheiner, Emmet Horan.

MILWAUKEE—Pirate Motor Mfg. Co.; $50,000; manufacturer gasoline engines. Herman Roth, Julius Tanck, John Krohn.

MILWAUKEE—Wells Garage Co.; $10,000; garage. Charles Bublin, E. A. De Sarnelle, Samuel Carroll.

MILWAUKEE—Wisconsin Automobile Business Assn. of Milwaukee; no capital stock. H. E. Wilson and eleven others.

NEW GLARUS—New Glarus Automobile Co.; $5,000; dealer. N. K. Zweifel, H. M. Steussy, N. H. Steussy.

OSHKOSH—Universal Motor Co.; $25,000; to take over the business of Termaat & Monahan Co., gasoline engines and motors. J. D. Termaat, L. J. Monahan, A. B. Dye.

RACINE—Electrical Shop; $5,000; to manufacture, repair and deal in electrical devices, etc. William Pratt, Kerner Brandeis, Fulton Thompson.

Automobile Agencies Recently Established

PASSENGER CARS

Arkansas

Fort Smith	Franklin	J. Witherspoon

California

Arbuckle	Kissel	A. J. Atran
E. Auburn	Kissel	O. E. Thomas
Los Angeles	Simplex	Simplex & Mercer Pacific Coast Agency
Los Angeles	King	English Motor Car Co.
Los Angeles	Ohio	Washington St. Electric Car.
Marysville	Kissel	Marysville Garage
Oakland	Ohio	Huey-Hood Motor Car Co.
Riverside	Kissel	Fairmount Garage & Mch. Wks.
Sacramento	Oldsmobile	F. C. Peters
San Francisco	Simplex	Simplex & Mercer Pacific Coast Agency

Canada

Berlin	Regal	L. C. Browne
Calgary	King	Diamond Motor Car Co.
Chatham	Ford	J. M. McCoig
Hamilton	Chandler	F. G. Morris
London	Oldsmobile	London Motor Sales Co.
London	Franklin	London Engine S. Co.
Mildmay	Regal	G. Kuneman
Mildmay	Saxon	Hunstein & Reuber
Montreal	Grant	Legare Gadbois, Ltd.
Montreal	Hupmobile	The Comet Motor Co
Montreal	Grant	Gareau Motor Car Co.
Montreal	Briscoe	Lussier Garage, Ltd.
Port Arthur	Franklin	D. Boreau
Port Arthur	Saxon	Central Garage
Quebec	Moon	Le Page Co.
Regina	King	Wright & Mitchell
St. John	Oldsmobile	New Brunswick Motor Car Co.
Sarnia	Oldsmobile	R. Milligan
Sault Ste. Marie	Regal	G. P. Black
Sherbrooke	Reo	R. A. Webster
Toronto	Oldsmobile	Croftan Storage Battery Co.
Toronto	Paterson	F. A. Harvey
Toronto	Simplex	Thompson

Colorado

Denver	King	Mid West Auto Sales Co.

Connecticut

Greenwich	Detroiter	Enders & Abrams
Hartford	Davis	Asylum Hill Garage
Hartford	Davis	J. C. Collins
New London	Oldsmobile	J. B. Getchell
Stamford	Lexington	The Motor Sales, Inc.

Georgia

Atlanta	Remington	Arlington Motor Co.

Idaho

Twin Falls	King	F. A. Nelson

Illinois

Altamont	Case	F. Schlotterbeck
Anna	Oldsmobile	R. Tuthill
Bloomington	Davis	Davis Motor Car Co.
Chicago	Simplex	Tennant Motor, Ltd.
Chicago	Lexington	T. C. Vawter
Creston	Case	Louis Vesta
Decatur	Davis	F. M. Webbs
Effingham	Metz	G. F. Walters
Elksville	Pullman	C. T. Bass
Madison	Metz	A. V. Wallace
Minonk	Davis	Minonk Central Garage
Morrison	Franklin	O. Woods
Mt. Carroll	Case	W. E. Brown
New Baden	Pullman	J. J. Kock
Noble	Metz	E. Warren
Oak Park	Davis	W. A. Pillinger
Pekin	Davis	Pekin Palace Livery Co.
Pontiac	Case	W. Algoe
Pontiac	Davis	C. C. Johnson
St. Jacobs	Pullman	St. Jacobs Hardware Co.
Springfield	Lexington	R. Haas Elec. & Mfg. Co.
Stanford	Davis	Standford Auto Co.
Sycamore	Case	Loptien Bros.

Indiana

Crawfordsville	Saxon	Arnold, Hill & Turpin
Dyer	Case	Fitch Brothers
Indianapolis	Cole	Cole Sales Co.
Lafayette	Saxon	Columbia Tire & Auto Co.
Moreland	Davis	M. A. Clark
Pendelton	Davis	J. Benefiel
Tipton	Davis	J. E. Lower

Iowa

Burlington	Lexington	Farmers Motor & S. Co.
Conrad	Case	Case Motor Car Co.
Conroy	Lexington	Geiger & Martinson
Davenport	Mitchell	McGivern Motor Co.
Fairfield	Oldsmobile	E. S. Thomas
Fort Madison	Glide	Winke Brothers
Keystone	Imperial	Miller & Shreeves
Lansing	Case	Hufschmidt & Wendel
Mason City	Imperial	Snyder & McCall
New Hampton	Davis	J. L. Curtis
Toledo	Franklin	Jones Bros. Auto Co.
Westgate	Imperial	Tegtmeier Bros.

Kansas

Argonia	Case	Achelpohl & Bringer
Great Bend	Imperial	E. E. Cook
Hutchinson	Case	E. H. Steinford & Rexorad Engineering Co.
Independence	Oldsmobile	R. A. Stone

Kentucky

Winchester	Case	People's Motor Car Co.

Maine

Anson	Dodge Bros.	George Hovey Sullivan
Camden	Kissel	W. C. Howe
Casco	Maxwell	Cook-Hall Co.
Easton	Detroiter	Kneeland Bros.

Maryland

Baltimore	Simplex	The Rice Garage
Baltimore	King	Randall Mfg. Co.
Federalsburg	Detroiter	R. S. Messenger
Preston	Oldsmobile	H. M. Hollis & Co.

Massachusetts

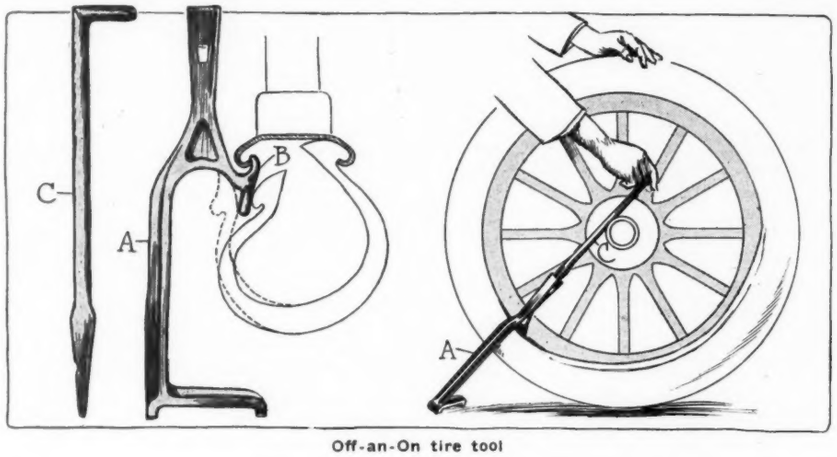
Boston	Allen	E. A. Gilmore
Boston	Milburn	E. Y. Simpson
Boston	Paterson	R. W. Vining
Boston	Pathfinder	W. Hilliard
Boston	Empire	Leo Spigelmilch
Boston	Apperson	Brown-Apperson Co.
Boston	Premier	Eads-Loud Co.
Boston	Simplex	G. W. Canterbury, Inc.
Boston	Stewart	H. Ross Maddocks
Boston	Regal	C. P. Robinson Co.
Boston	Ohio	D. C. Tiffany Co.
Campello	Detroiter	Franklin Motor Co.
Fall River	Oldsmobile	Pocassett G. & M. Co.
Fall River	Maxwell	T. Paquin
N. Adams	Saxon	A. S. Williams
Springfield	Hudson	Harrington-Gifford Co.
Woburn	Overland	J. H. Bates & Son
Worcester	White	White Motor Co.
Worcester	Detroiter	Louis Bellinger

Michigan

Battle Creek	Imperial	Independent Garage
Battle Creek	Saxon	Frank Palmer
Battle Creek	Saxon	F. Palmer
Charlevoix	Saxon	B. Brown
Clare	Saxon	Kelley & Ballard
Davison	Dodge	Art Cullen
Detroit	Ohio	Gordon Auto Sales Co.
Detroit	Monarch	Addison Garage
Detroit	Empire	Addison Garage
Detroit	Kissel	Addison Garage
Detroit	Milburn	E. I. Rumsey

ACCESSORIES

TIRE-REMOVING Tool—It is somewhat remarkable that considering the age of the pneumatic tire it should still be possible to design or invent improved tools for removing it from or placing it upon the clincher type of rim. There have been very many attempts to produce tools which would render this task quick and easy to the least skilled, but few of these have been really satisfactory because they have rarely been easy to use without some practice, while they have often been costly to buy. Meanwhile the coming of detachable flange rims and similar devices has made it less easy to produce a tool which was both good enough and cheap enough to be worth buying.



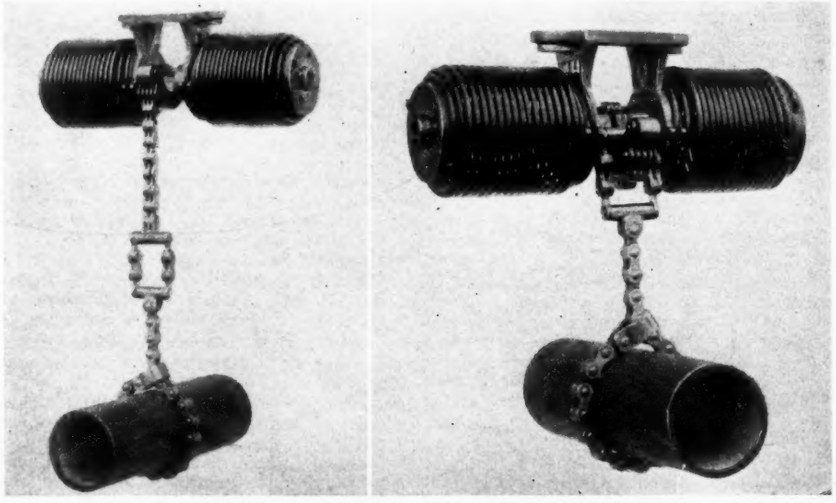
Off-an-On tire tool

The most recent attempt to solve the tire-handling problem in a way that can appeal to the owner of a low-priced car who naturally does his own work and has not either money or inclination for the purchase of costly equipment, is illustrated here and its action is so simple that it is difficult to describe. Once seen in action the tool proves its own case, but by careful reference to the sketches it will be possible to understand the simple theory of the operation.

The principle of the tool is that of the ordinary tire lever, but instead of applying a lifting leverage to several points on the tire, a short lever is inserted at one place and turning the wheel then causes the tire to be lifted from the rim all the way round. The main part of the tool is the malleable "leg" A, which has on it the little lever or wing piece B. There is also a plain lever of fair length C, which is used for releasing the first inch of the casing from the clinch of the rim and then is combined with part A to hold the latter while the wheel is pulled around by hand. The plain lever is easy to insert and as soon as the tire casing is lifted at one point the wing B is inserted and the leg A turned through an angle so that one wing tip rests in the clinch of the rim and the other is hooked inside the bead on the casing. Having reached this stage the wheel is turned round till the foot of the leg part A comes in contact with the ground, and the plain lever is then socketed into A and rested against the hub cap and on pulling the wheel round against the resistance of the tool the tire simply falls off.

To replace the casing one tip of the wing piece is put in the rim clinch as before, but instead of hooking the other tip inside the bead of the casing it is left *outside*; turning the wheel then forces the shoe back just as it pulled it off in the previous operation. During the replacement the tube and valve must be in place, as the valve is relied upon to prevent the casing standing still while the wheel is pulled round within it.

For use with a wheel that has no hub cap, such as a wire wheel for example, there is a second socket hole in part A so that the plain part C can be put in at right angles and its outer end also brought against the ground so as to give a rigid support against the turning of the wheel. The tool sells for a ridiculously small sum and, being in two parts, takes up but little room; it could be accommodated easily in any ordinary tool kit.—Stewart Accessories Co., Detroit, Mich.


Parker rebound check in extended and contracted conditions

Rebound Check—A new type of rebound check for mounting between the axle and frame of a car is the Parker, which employs the principle of the cam. Fixed to the frame at any convenient point is a bracket bearing a pair of torsion springs, two ends of which are anchored to the bracket. The other two ends are attached to a short shaft carrying a cam, and on this cam is wound a steel chain which is also clipped to the axle. Thus when the car strikes an obstacle the axle rises toward the frame and the torsion springs wind up the chain as it does so. As soon as the axle has reached its top position and begins to descend the springs hold the chain taut and resist the rebound action of the main car spring. The effect of the cam is to proportion the pull of the springs to the range of movement provoked by any shock.—Rupe & Kemp, Muncie, Ind.

Inner-Tube Construction—There are two weak spots in the ordinary tube, one where the two ends of the tube are lapped to make the joint, and the other the inner periphery of the tube, where it lies in the rim. The joint of the ends is weak because increased thickness causes increased heating and also reduces expansibility of the rubber, and the part in the rim is weak because it is not so well supported as are the parts of the tube in contact with the outer casing. In the "American" inner tube an attempt is made to overcome these two defects by proportioning the parts to meet the conditions. Firstly, as regards the joining of the ends of the tube, this is done by a flush vulcanization which does away with the increased thickness, and then to guard against weakness caused by extra stressing of the part in the rim, the inside circumference of the tube is made of double thickness. Thus instead of making up the tube so that its walls are of even thickness, there is an extra bulk of rubber to fill the rim between the edges of the beads on the casing. The effect is that of having a cushion bedded in the rim, but has none of the inconvenience of a loose bit of rubber; also a loose ring to fill the rim would be a nuisance and a danger, too, as it might easily nip the tube.

A feature of the tube is also the nature

of the rubber cure employed, this being claimed to render the rubber capable of constant repair, should the owner be unfortunate with punctures. Thoroughly cured rubber of the right quality can be repaired by vulcanization an endless number of times without injury and it is an advantage to have tubes of this class in use, because the time always comes sooner or later when repairs will be needed.—American Tire and Rubber Co., Akron, O.

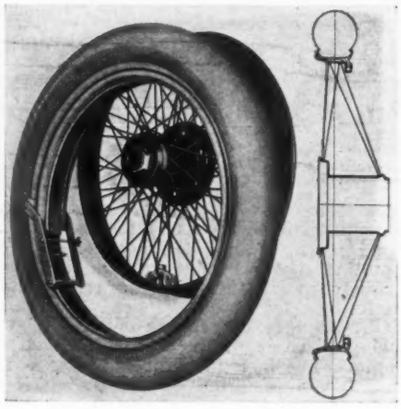
G. R. C. Wire Wheels

Detachable wire wheels were introduced in Europe largely on account of the use of regular clincher tires which are hard to remove from the rim, particularly in the larger sizes. For this reason, the wire wheel, made detachable, received a royal reception in Europe as it was a means of reducing the labor of tire-changing, one of the most disagreeable drawbacks to motoring. In America, where detachable tires and demountable rims are standard practice, there is not the same reason why additional wheels should be carried in order to carry spare tires.

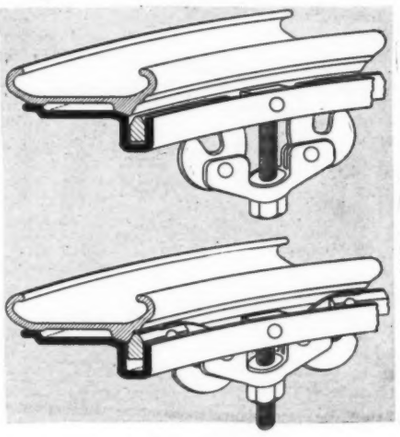
On a new wire wheel called the G. R. C. the method of attaching rim to wheel, by means of an expanding ring, operated from a single point, cuts down the time required for removing the rim from the wheel to a few seconds. There is less weight to handle in making a tire change on the road, as there is only weight of rim and tire to consider.

Each wheel is permanently bolted to the car and no special device is necessary for carrying spare tires, as any rim carrier now in use will accommodate the spare rim with tire.

The tire-carrying rim is attached to the wheel band by means of an expanding ring located in a groove forming the front portion of the wheel band. This ring engages the front surface of a supporting bead, on the under surface of the rim and the ring is expanded or contracted by means of a toggle device, operated from a single point. The wheel band and ring are assembled as a unit, and when applied to wheels, there are no other parts to be considered except the tire-carrying rim, which consists of a single piece section (either clincher or straight side interchangeable on the same size wheel band) cut transversely at one point; the cut or split being joined together by a clip attached to the under side of rim end on one side of the split, the clip having its opposite end upturned to engage a slot on the other side of the split. When the rim is in its closed position, a swiveled lever engages the clip which locks the rim in its circular shape.



G. R. C. wire wheel



G. R. C. rim lock

The rim is supported around its entire circumference by the wheel band, including the portion at the split, and the ends of the rim at the split are supported and lined up by means of the wheel band and expanding ring, making a smooth joint which cannot injure the tire.

The details are made fairly clear by the illustrations which show the action of locking the detachable rim in place and also the complete wheel. Alongside the latter it will be noticed there is a sectional view showing the spoke arrangement and this is a feature of the design, for it is claimed that setting the spokes in this way gives the greatest possible strength to resist side stresses. The makers of this new wheel are very confident that the slow progress of the wire wheel in America has been due to the marketing of some faulty patterns and that the wire wheel will win out in the end is their belief. Certainly the rim detachment is simple and should be very easy to operate, while there can be no doubt concerning the efficiency of the locking arrangement.—General Rim Co., Cleveland, O.

Catalogue and Pamphlet Review

Rawhide Pinions—These are used a good deal in electric motor drives, though they are not often found on automobiles in these days. A recent circular calls attention to the fact that they are a specialty of—Turley Gear & Machine Co., St. Louis, Mo.

Warning Bell—There are a few people who prefer a bell as a warning signal for automobile use, and in some circumstances it is desirable for special reasons. There is not a very wide choice of such accessories, and it is thus useful to know of a maker whose product is rugged in detail and good in external appearance.—Liberty Bell Co., Cleveland, O.

Folding Tire Pump—This is a short-stroke, large-diameter pump that clips to the running board of the car, and is then operated by a long lever arranged for easy hand manipulation. When out of use the whole pump folds together into very small compass so that it may be stowed in the tool kit very easily.—Eugene Atkins Co., Elkhart, Ind.

Radiator Curtain—A radiator curtain for use in cold weather is no novelty, but a new concern is embarking on the manufacture of a design that is under the driver's control from his seat. The whole thing can be attached without bolts. Briefly, it consists of the application of the spring blind roller to the special needs of the location.—Delaney & Lamothe, Fitchburg, Mass.

Inexpensive Shock Absorber—The value of the ordinary type of spring shock absorber—more properly called supplementary coil springs—is now fully appreciated, and there are many different kinds to choose from. One of the simplest, and also one of the cheapest, is the Pamco, which is applicable to practically any car with a minimum of trouble.—Auto Devices Co., St. Louis, Mo.

Anti-Rattle—Two parts of a car that are apt to rattle when old are the steering tie rod ends and the starting crank. A spring support for the latter and a pair of neat little clips for the former parts are specialties made for Ford cars in special patterns and also in a universal pattern for all other cars. The anti-rattlers for the tie rod utilize a small spring to keep the parts in tight contact and so prevent shaking.—King Specialty Mfg. Co., Brookline, Mass.

Battery Charging—A simple and inexpensive apparatus for charging ordinary automobile batteries is always useful, for it is sometimes convenient to use the lights on the car for long periods in the evening without running the motor. For users whose homes are supplied with alternating current the "Autrec" is a small rectifier which costs very little, and will give a charging current of about a couple of amperes. It will revive a partially exhausted battery over night.—American Battery Co., Chicago, Ill.

Welding Outfit—The value of acetylene welding for the repair of automobile parts is now an accepted thing, and very many garages are equipped for work of this character. It is sometimes troublesome, however, to choose the details that go to make up a proper outfit and the repairman is liable to find that the cost when he has got everything, exceeds his estimate by a good deal. The "Economy" portable welding outfit has been got together to meet this condition containing every necessary tool for ordinary jobs and is obtainable at a price which the purchaser can be satisfied includes everything he needs except the oxygen and acetylene gases.—Economy Welding Machine Co., Kansas City, Mo.

For Engineers—"Blaisdell Equipment" is a book that ought to be amongst the manuals of every engineer who has anything to do with compressed air, as it is much more than a catalogue of Blaisdell machines. Pages are given to discussion of the uses of compressed air, to the problems of compressor design and to the installation of pipe lines and equipment for dealing with compressed air. There are also useful tables of data regarding all sorts of things, such as the amount of air passed per minute by a round hole, given the size of the hole and the pressure behind it. It is altogether a quite exceptional book of its kind for the useful facts contained in it.—Blaisdell Machinery Co., Bradford, Pa.